

DICTIONARY

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THE ECONOMIC PRODUCTS OF INDIA.

BY

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> (ASSISTED BY NUMEROUS CONTRIBUTORS.) IN SIX VOLUMES.

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Gossypium to Linociera.



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DICTIONARY

OF

THE ECONOMIC PRODUCTS OF INDIA.

The Cotton-vielding Plants. (Watt & Murray.) GOSSYPIUM.

GOSSYPIUM, Linn.; Gen, PL, L, 209.

A genus of the Natural Order MALVACEAE, the species of which are widely distributed on both sides of the Equator, and in both hemispheres. On the North they extend, under cultivation, as far as the shores of Southern Europe, and on the South to the Cape of Good Hope.

The limitation of the forms of these very important cultivated plants, to definite species, varieties, hybrids, and races, has much perplexed writers on the subject. The vast importance of the floss, obtained from the seeds, has induced an extensive cultivation, and that, too, under almost every condition of climate and soil. The ease with which climatic conditions originate local forms, and the rapidity with which hybrids are produced, have *both* combined to bring about a degree of complexity that perhaps exists with no other agricultural crop. The departures from original specific conditions are in fact so great as to render it almost impossible to determine whether the cotton-yielding plants have been derived from three or more species, or are all mere develipments from a protean ancestor which possessed indigenous Asiatic, African, and American representatives. This being so, the authors have found it undesirable, at present, to attempt more than a brief review of the botanical literature of the subject. They are conscious that many ambiguities and even errors may be thereby reproduced, but unavoidably so, for, until a thorough and original investigation has been conducted with the living plants, nothing definite can be published regarding the cultivated cottons of India The classification which follows may, however, be accepted as denoting some of the chief forms recognised by us, but the accuracy of the relegation of vernacular names and of the restriction of special properties to definite forms, is open to the gravest doubt. This is due to the authors having been practically limited to a compilation from published works and official correspondence. The primary object of the present effort may in fact be viewed as an attempt to suggest some of the main lines on which a scientific classification of the Indian indigenous and exotic cottons, and of their hybrids, might in the future be conducted, rather than to produce a treatise professing originality. It must, however, be admitted that no real good can be

This knowledge could doubtless be arrived at after the different forms of cotton had been scientifically worked up, and the degree of their hybridisation and the nature of *that* hybridisation clearly established. Indeed, it is at present impossible to write with any degree of confidence regarding¹ this—one of the most important of Indian crops,—since it is often difficult to know what torms are referred to by writers who employ local and vernacular names only, when discussing their properties. *I* hus, for example, a District Officer writing of *Nurma* cotton may be understood to be speaking of some of the forms of G. **arboreum** or of some hybrid between that species and **G. herbaceum**— *Deshi* cotton with purple instead of yellow flowers. Indeed, it seems highly I

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GOSSYPIUM*

The Cotton-yielding Plants;

improbable tfiat any form of Indian cotton can be said to belong, strictly speaking, to the Linnean species, **G. herbaceum**. **On** the other hand, nearly every writer on Indian cotton has denied the existence of **G. arboreum** as **a** field crop, whereas the chief cotton of Eastern and Northern India seems undoubtedly to be a foFm of that species. In fact, in this distinction lies the chief difference between the Indian cottons of the Eastern and Western pennr sulas, the latter being mainly derived from a form allied to, but (juite distinct from, **G. herbaceum**.

sulas, the latter being mainly derived from a form allied to, but (Juite distinct from, **G. herbaceum**. Much has been done to discover the soils suited for cotton generally, and under orders of Government, many valuable experiments have been made, with exotic forms. What would appear to be the foremost and most essential enquiry has, apparently, however, been entirely neglected, namely, a scientific and exhaustive investigation into the existing conditions of Indian cotton. Until this has been done experiment can be but blind groping in the dark, which by chance may now and then fall upon facts of importance, but only after needless expenditure of time and money. To effect improvement in the indigenous cottons would of necessity confer a more lasting benefit to the country than even success in acclimatisation of exotic forms. To accomplish this, the endemic cottons must first be worked up. The climatic and other causes which tend to preserve or destroy good or bad properties must be thoroughly established. The influences of hybridisation must be worked out on a scientific basis, by testing the strength of strain, from this species or that, best suited to the environment. The tendency of retrogression from a prized hybrid to either ancestor should not be a matter of periodic deprecation; it should be understood, and, if possible, prevented or the exhausted stock promptly replenished. When experiment and study have furnished the required data on which to act, it will almost for certain be found, that to preserve the cotto* of a province or district up to **a** required standard, specially grown and artificially hybridised stock will be imperatively necessary. Indeed, the establishment of nurseries or seed farms, for this purpose, on a more rational basis than heretofore attempted, would, in all probability, prove the greatest reform possible for the cotton industry of India. When the quality of stock has been improved, attention might hen be turned to the modes of cultivation and methods of cleaning the fibre, but

It will be observed by a comparison with what **Dr. Maxwell T. Masters** has written that, in discussing the forms of **Gossypium,the** authors have on the whole followed botanically (as is customary in this work) the classification of the *Flora of British India*. **Dr. Masters** recognises four species; — **G. Stocksii Can** indigenous plant met with on the limestone rocks of the Coast of Sind); **G. herbaceum** (the chief source of the so-called indigenous *or deshi* cultivated cottons); **G. barbadense** (the American cotton); and **G. arboreum** (the tree cotton, which, according, to **Masters**, is probably a native of Africa). Dr. **Masters**, and following him many other authors, incline to the view that **G. Stocksii** is the wild form, from which the cultivated **G. herbaceum** has been derived. As opposed, however, to this it may be pointed out that, while the description of the leaf of **G. Stocksii** (as given by **Masters**) would in part support that view, its naked seed and laciniated bracteoles point to an affinity **to G. barbadense**. ^ This so-called wild species is only found, however, near the coast, and hence it may prove but an acclimatised form or possibly one of the numerous hybrids that undoubtedly exist in India. **TodarO** seems, however, to have advanced a new theory regarding the Indian cottons. The vast majority **of the** "mportant growths, he informs us, are hybrids, not true species, hence unaer altered conditions, as, for example, on being removed from one district to another, they manifest a strong tendency to depart from their recognised and valued properties. He has further described many forms as species between which his hybrids have been produced, *and he practically excludes* **G. herbaceum** *from being an Indian species*. Of his species he urges, for example, that

The Cotton-yielding Plants. (Watt & Murray.) GOSSYPIUM.

G. Wightianum has a stronger claim to being recognised as a truly indi-genous Indian plant than G. herbaceum. A variety of G. herbaceum, viz., microcarpum, he informs us, is, however, frequently met with, as also a second variety, G. obtusifolium, but the typical form of G. herbaceum» according to Todaro, does not occur in India. His variety, microcarpum, he affirms, is the Dhnllera cotton of merchants, a plant which, like G. neglectum, Tod, (referred by most botanists to G. arboreum), readily hybridises with G. Wightianum. These hybrids constitute the better class of Indian cottons, such as the Hinganghat, Oomraoti, &c. Dr. Masters follows the usual acceptation of the species G. herbaceum ; and, doubtless according to him, G. Wightianum would be regarded as a variety or hybrid between that species and one or other of the forms of G. arboreum. In *Indian Herbaria* G. Wightianum, Tod., is often named G. herbaceum, var. hirsutum; this is the case, for example, with Kurz's specimens from Pegu in the Calcutta Herbarium. The plant is certainly mote densely hairy than **G. herbaceum**, and the hairs are stellate, which gives it a velvety and ashy appearance. It seems, in fact, probable that much of the confusion regarding **Todaro's** species is due to its having been spoken of ultimately as G. **hirsutum**, *Linn.*, **a** plant to which it has little or no affinity. There is probably no doubt that, whether recognised as a hybrid or species, **G. Wightianum** is of the greatest importance to India, whether much more so than either **G. herbaceum** or **G. arboreum** between which even much more so than either G. herbaceum or G. arboreum, between which in many of its characteristics it is intermediate. **Todaro's** experiments would, however, support the theory of G. Wightianum being an independent species. The hybrids produced with it from G. neglectum or G. herbaceum, var. m microcarpum, were fertile and afforded seed which, in some cases, yielded cotto of a superior quality, but in a ye^A or or two these hybrids gradually lost their merit (if not carefully cultivated), and reverted, in the majority of cases, to G. neglectum, more rarely to G. Wightianum. Experimenting withG. herbaceum and G. Wightianum by growing them in sterile soils and without irrigation, **Todaro** found the latter species to preserve its characteristics even more persistently than the former. Further, he noted that the good qualities of a hybrid were longer maintained when it was grown at a distance from either of its ancestors.

Todaro has, in a like manner, suggested **a** line of enquiry with **G. arboreum**, of the greatest practical importance. He isolates a condition which he designates **G. neglectum** from **G. arboreum**, *Linn*. According to **Todaro**, **G. neglectum** has played a far more important part in the Indian cotton question than the true **G. arboreum**. He cites the following synonyms and plates for his new species:—

G. neglectum, *Tod.*, with the synonyms **herbaceum** (*var.* China cotton of Roxburgh and of Royle, *non-Linn.*); **G. herbaceum**, *Wight*, *Ic.*, t, n; **G. arboreum**, *Parlatore*, *in part*; **Cudapariti**, *Rheede*.

Under his species he also forms a variety with the name **Roxburghianum**, and mentions the following synonyms for that:—G. herbaceum (*var*. Dacca Cotton, of Roxburgh); and G. indicum (*var*. Dacca Cotton, of Royle).

G. neglectum, thus isolated from **G. arboreum**, differs chiefly in being sub-herbaceous, in having broader, less pointed segments to the leaves, and in possessing an acutely pointed ovary. The type form of **G. arboreum**, *Linn.*, is more arborescent, has the segments of the leaves (**Todaro** affirms), bristle-tipped, with the fruit rounded. But in **Parlatore**'s picture, cited as in part **G. neglectum**, the flowers are purple, whereas in *Royle*s III. Him. Bot.*, *table 23, fig. i* (which is *Wight's Ic, t. IT.*, quoted above), the flowers are shown as yellow with a purple centre. **Todaro** states that while **G. arboreum**, *Linn.*, occurs only near temples and in gardens, **G. neglectum** is extensively cultivated as a field crop, and is in fact the chief source of the so-called Bengal cottons of commerce. It is said to have always yellow flowers with a purple centre, and in this respect resembles **G. Wightianum** and other Indian cottons. Hence it would appear probable that all the purple-flowered field cottons of

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GOSSYPIUM arboreum.	The Indian Arboreous Cottcns.
	wrote, ^w is a perennial plant, lasting for four or five years or more. It grows in every kind of soil; but attains perfection only in the light, sandy, gord! lands. The wool is fine, silky, of considerable strength, and fully an • inch long. Hedgerows, gardens, and groves of trees about the abodes of devotees and temples, are the places where the plant is found. Muslins and turbans are made from it. Since the introduction of European cloth, the culture of this cotton has almost entirely ceased. Its yield per acre is estimated at one hundred pounds of clean cotton in the first year, and in the second at from three to four hundred pounds. The great hin- drance to its cultivation is the fact that it requires protection throughout the year. The price of this cotton in the market at Broach is always double that of the common country article. But there are never more than a few pounds procurable!' In the <i>Broach Gazetteer</i> it is added to the above that " <i>Nurma</i> or <i>deva kapas</i> (Gossypium religiosum), would seem to be grown only to a small extent, chiefly near temples and the dwellings H ascetics. It is used in making the caste thread (<i>Jandi</i>). [#] Before passing from this subject it may be pointed out that the above opinion as to the value of <i>Nut ma</i> cotton, is most probably greatly over-estimated. A far more serious error has, however, been made in regarding one of the conditions of this species as a form of G. herbaceum. This has been cleared up by Todaro, who has isolated as species many forms hitherto viewed as but cultivated races. Some of these he has associated with G. arboreum, others with G. herbaceum. While viewing Todaro as having materially advanced the study of the species of Gossypium, we are not pre- pared to agree entirely with him that G. Wightianum and G. neglectum are good species. They are perhaps at most vanetios, if, indeed, they are anything more than hybrids, derived from the two originally Asiatic (or Old World) species, represented by G. arboreum and G. herbaceum. But, whether species, v
3 Conf. with pp. 8-14; 63; 102; 103; • 19; 134; 142.	ed as follows: — n G. arboreum, proper. DIAGNOSTIC CHARACTERS.—Arborescent, cultivated in 'gardens only or near temples; not a regular field crop. Leaves, 5-7 lobed with an extra tooth in the left side sinus (or both sides) of the central lobe; tnick, leathery, sub-glabrous or with short, abortively stellate hairs on the leaves and longer hafrs on the petioles and young stems: lobes bristle-tipped: petiole long, rigid: <i>stipules</i> falcate. Inflor- escence axillary, generally one-flowered; peduncle about \$ the length of the petiole, but jointed above the middle, bearing a small leaf and two stipules at the joint. <i>Flowers</i> small, purple, a little less than twice the length of the bractcoles; brae- teoles medium-sized, base with round ears, apex ovate, acute toothed or sub-entire. Ovary rounded; seeds with greyish black velvet underneath the floss. Todaro figures this plant, as well as C sanguineum Hasskard on Tab'o
	Todaro figures this plant, as well as G. sanguineum, <i>Hasskarl</i> , on Tab'e I.: we regard both these as representing the Linnean plant. The differences in sanguineum are very slight '.—purplish stems, petioles, and bracteoles; lobes of the leaves scarcely constricted at the base, and lower pair much smaller than the others; bracteoles, as a rule, more deeply toothed. Wight's /*, t. 10 (taken from <i>Royle, III. Him. Bot., t. 23, f. 2)</i> , is a very indifferent representation of G. arboreum; infact in hairiness and shape of bracteoles it more nearly resembles the form indicated above as G. sangiineum, $H < isskarl$. G. arboreum is the <i>Nurma</i> or <i>Deo</i> cotton of most writers.

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, Th! Indian Arboreous Cottons. { <i>Watt</i> < & Murray.) _{a r}	OSSYPIUM boreum -
densely coated with long spreading* hairs, and, if hybridised with G. Wightianum, having stellate hairs as well: <i>stipules</i> broad. linear. <i>Inflorescence</i> on short lateral broads 2.4 flowered.	4. Conf. with 9 pp. 8-14; 9 8 102; 111; 118; 129; 134; 143; U7-
An excellent plate of this plant will be found in "The Field and Garden Crops "under the name of G. herbaceum. Par latore's plate of G. arboreum represents, on the whole, the Garo long-boiled condition of G. neglectum except in the colour of the flowers, and Wight's A?., $t.11$ (taken from <i>Royle, Ic</i> $t. 23$, $/\dot{w}$), is a good illustration, except in the fact of the in- florescence being shown solitary flowered, which it rarely is in typical conditions of this species—the <i>rad hi a</i> and <i>martna</i> cotton of Upper India. Todaro says that, having cultivated this plant for fifteen years, he never saw it with red flowers but always yellow and of a brighter tint than in G. herbaceum or G. maritimum—more resembling in fact the flowers of G. Wightianum. But Roxburgh's Dacca cotton, which Todaro refers to this species, has the petals tinged with red. G. neglectum is extensively cultivated in Bengal, the North-West Provinces, and the Panjab, con- stituting to a large extent the so-called "Bengals" of commerce.	Conf. with p. 60.
For probable hybrids of this species, see the remarks under G. herbaceum. I. (For II. see p. 16.) THE ARBOREUM SERIES OF COTTONS. Vern.—Nurma, deo kapas. HIND., (Borailli, tangori? DACCA)*3ENG.; Budi kaskom, bhoga kuskom, SANTA L; BogalT, nurma, BUN DEL.; Manua, radhia, nurma, NW. P.; Kapas, PB.; Mannua, deo, C. P.; Deo kapas, BOMB.; Deva kdfiisa (according to Sakharam Arjun), MAR.; Deo kurpas (God's cotton), MYSORE; Shem paratie (according to Ainslie), semparuthi, TAM.; Patti, TEL.; Nu-wa (according to Macon), DUMM Kdardacum, (coverding to Elliot) SANS	5

Mason), BURM.; Kdrpdsamu (according to Elliot), SANS.
References—Roxb., Fl. Ind., Ed. C.B.C., Si 9; Dais. & Gibs., Bomb. Fl. Supp., 8; DC. Origin Cult. PL, 405; Graham. Cat. Bomb. PL, 15; Sir W. Elliot, Fl. Andh., 84, 146; Rheede, HoH. Mai.; Rumph. Amb.; Burm. Fl. Ind.; Mason, Burma & Its People, 51S, 756/ Hove, Journal of Tour in Bombay made in 17S7; Ainslie, Mat. Ind., II., 284; Dymock, Mat. Med. W. Ind., 2nd Ed., no; Pharmacog. Ind., 225; Bent. & Trim., Med. PL, 37; S. Arjun, Bomb. Drugs, 17; Lisboa, U. PL Bomb., 228; Royle, Cult* & Com. of Cotton in India, 144-145; Prod. Res., 221.
In the Jours. & Trans, of the Agri-Hort. Soc. of India, frequent mention is made of Nurma cotton. of these the following may be specially cited:—Trans. V. (Proc), 6§; VII. (Proc), 17; Jour. (Old Series), I., 278; II., 437; IV., 106, 108; XI., 29s, et seq.; (New Series) II. (Proc. 1870), AL*VI. Mason), BURM.; Kdrpdsamu (according to Elliot), SANS.

Habitat.-The typical condition of this species is a low tree or shrub, met with in garden cultivation throughout India. Except, perhaps, in a state of hybridisation it rarely occurs as a field crop, but, as explained above, it seems probable the purple-flowered indigenous cotton crop, mentioned by many writers, is of this nature. The chief commercial form of this species is, however, the plant isolated by Todaro under the name of G, neglectum.

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GOSSYPIUM arboreum.	The Indian Arboreous Cottons.
CULTIVA- TION. 6	CULTIVATION. 6. neglectum is existively cultivated as a field crop. It has bright yellow flowers, and deeply palmately segmented leaves, which in shape are scarcely distinguishable from G. arboreum proper, except in that they are more herbaccous and very much more hairy. How far G. neglectum, Tod, may, by future observers, be confirmed as of specific value, we are not at present prepared to affirm. It seems, indeed, quite likely that it may prove but a hybrid between G. arboreum and one of the plants be- longing to the series which we prefer to continue designating G. herba- ceum. But whether species or hybrid, there is nothing gained, but, on the species Todaro refers all the China and Dacca cottons described by Roxburgh as forms of G. herbaceum, but while some of the Dacca cot- tons seem to be of this nature, others most certainly are not. There is, however, a much stronger taint of G. neglectum in the cottons of Eastern and Northern than in Western India, where G. Wightianum becomes the Todaro's description of G. neglectum, and the cottons of the Santal fordaro's description of G. neglectum, and the cottons of the Santal sountry are very similar, though they differ, not only from the Garo cot- who has kindly furnished admirable botanical specimes of the two cottor- sof Manbhum, informs us that they are grown at different seasons, and are other. The Rev. A. Campbell, of the Santal Mission, who has kindly furnished admirable botanical specimes of the two cottor- sor of the homestead lands. It flyvers in November and yields a larger frop than the former (<i>Bhaga</i>), but, as it requires a richer soil, is much less this is more frequently met with from 2 to 3 feet in height. Mr. Campbell divisibed a sample of this we are unable to say what it may be : it is, the flowes is obstich if there share earbore as sufficiently certi- strong and <i>Budh</i> i as seen in the herbarium is, however, so slight the simposible to give a discust the synom as furgued. As he has not for making cloth. It has a s
	writers, is well known in Malwa. Dalzell and Gibson fell into the error, C

I ne Indian Arboreous Cottons. <i>Watt & Murray.</i>	OSSYPIUN
	a <mark>rboreum.</mark>
frequently made some twenty or thirty years ago, of assigning to this spe- cies the name G. religiosum, Roxb., but they call it by its most general ver- nacular name Nurma and speak of it as " arboreous, slender, hardy, har- ing the habit of a tree; cultivated rather extensively in the North-West Gujarat as a triennial (?), also in Sind. It derives its name Deo kupas' from being most extensively used for the sacred thread of the Banians, Monj." There would appear to be little doubt that the plant referred to above was a form of G. arboreum. With reference to the remarks below, on Hove's red-flowered cotton of Bombay, it is interesting to notice that Dalzell and Gibson's Gujarat field crop of G. arboreum is very pro- bably one and the same as that described by Hove in 1787. The Transactions and Journals of the Agri-Horticultural Society of India teem with papers and reports on cotton, but only from about the year 1850 do these deal at any length with the indigenous growths. The fof Towing passages may, however, be given in this place as presumably allud- ing to G. arboreum. So long ago as 1837 a Mr. D. F. McLeod of Sconf (Central Provinces) furnished the Agri-Horticultural Society with two samples of tree-cotton, both of which appear to have been G. arboreum, £., as defined in the <i>Flora of British India</i> . These were then known as <i>Munnooa</i> and <i>Deo</i> . The former was a green and the latter a black seeded condition. They were perennials and "yielded their cotton in the hot "These varieties are planted," says Mr. McLeod, *' by the natives near their dwellings, with a view to shelter, and the produce is chiefly used for mak- ing Brahminical threads. The <i>Munnooa</i> is also cultivated extensively in fields on the ranges east of Mirzapore." It may be surmised that the <i>Munnooa</i> totton of the above passage was G. neglectum, <i>Tod.</i> , and the <i>Deo</i> , G. arboreum, <i>L</i> . In 1842, an interesting enquiry was instituted into the subject of the Chanderi (Gwalior) cotton, from which the once famous muslins were made. This was at fir	Cultiva- Tion.

GÖSSYPIUM arboreum.	The Indian Arboreous Cottons.
CULTIVA- TION.	Indian tree cotton. Peruvian cotton, for example, is, like G. arboreum, frequently met with near temples and grows into a large bush or tree. Mr. Blount, Government Cotton Planter, in a report (1845) on the cottons which he found the natives cultivating in Goruckpore near Benares, mentioned, however, what appears to have been the same two forms of G. arboreum. These were known as <i>Bogali</i> and <i>Nurma</i> . The former, he wrote, was grown as a field crop, being sown at the commencement of the rains, and the latter raised near huts only. Both these plants produced their fibre in
Conf. with p. II.	February and March. The ordinary cotton of the district—that most ex- tensively cultivated—he contrasted u ith these, stating that it was known as <i>Kukli</i> . It was planted in February and gathered in June and July. There would seem little doubt but that, like the <i>Munnaoa</i> cotton of the Central Provinces, the <i>Bogali</i> must have been a field crop which nearly, if not ab- solutely, answers to Todaro's G. neglectum. Many subsequent writers dwell on ' the tree cotton,' * the red-flowered cotton,' the <i>Nurma</i> cotton• of the Benares Division of the North-West Provinces—a peculiar and perfectly distinct crop from the ordinary cotton of these provinces.
Conf. with p. 29.	Turning now to Bengal: in a long and most instructive report on the indigenous cottons of Eastern Bengal, written by Mr. T. Allan Wise in June i860, much light may be assumed to be thrown on the subject of Todaro's G. neglectum. From that paper, there would appear to be considerable likelihood that two or three of the Dacca cottons are forms of G. arboreum, one most probably G. neglectum, <i>Tod.</i> Whether that form was actually (as Todaro asserts) the reddish-tinged plant, with pointed leaves (described by Roxburgh as a variety of G. herbaceum), may be open to doubt. Mr. Wise specialises eight forms of cotton as found in Eastern Bengal, vir., (1) Tipperah Hills cotton : (2) <i>Sheraj</i> cotton : (3) <i>Bogga</i> cotton : (4) <i>Borailli</i> cotton: (5) Dacca cotton : (6) Dacca <i>Ta ngari</i> cotton: (7) Common Bengal cotton: and (8) Foreign cottons lately introduced. We shall revert to the subject of most of these cottons under G. herbaceum; but it is desirable to deal here with those that appear to belong te ⁻ the G. arboreum series. The <i>Sheraj</i> cotton, Mr. Wise states, "very probably comes from the Garo hills. It is considered, after <i>Borailli</i> , the second best cotton found in the bazars of Mymensing, and from it the cloth worn by the better class of natives is made. It is bought by the ryots in the bazars for their wives and daughters to spin into thread, which they sell to the professional weavers to make into cloth for the markets." The <i>Boggg</i> was a very inferior sort of cotton, used in making the <i>do~sutti</i> or 4 two-thread " cloth employed for sails. It was said to come from the landed proprietors and wealthy natives are fond of wearing. It is the landed proprietors and wealthy natives are fond of wearing. It is the landed proprietors and wealthy natives are fond of wearing. It is the landed proprietors and wealthy natives are fond of wearing. It is the lands quite clear of inundation. It bears pods every month in the year for three or four years in succession, and being in every way such a different plant frijm any of t

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of view, they are botanically almost identical. To what extent all the Dacca cottons may, in the same way, be but forms of G. neglectum we cannot discover. That that species (or hybrid) actually does occur in Eastern Ben- gal we have no doubt, but we have seen specimens of what we take to be G. herbaceum, var. obtusifolium, from Dacca, as also others that appear to be hybrids of G. neglectum with G. Wightianum. It is thus impossible to determine to what species, varieties, or hybrids Mr. Wise's eight Dacca cottons belong, more than to discover which of them may have been the Dacca cottons examined by Roxburgh and which Todaro consigns col- lectively to his G. neglectum. It seems highly probable that the Sheraj and Borailli cottons, at least, are forms or hybrids of G. arboreum, while the Dacca Tangort cotton, the cultivation of which is now practically abandoned, may have been G. neg- lectum. Speaking of the Dacca Tangort cotton Mr. Wise remarks that it was grown on high lands and appeared a*species peculiar to the district. "It grows on the high red clay lands to the north of Dacca and attains the height of five feet. It is sown in July and the crop reaped in February. It bears a light crop for two or three years, and is probably the same kind that formed the attraction to Cospassia and the rest cf these jungles which once teemed with a wealthy people who had brick houses, tanks, &c, all now in ruins, but which seem to have been gradually relinquished. Thus only a few years ago at Sodapore, a village to the north-west of Dacca, large fields of this cotton were sown, but now not a single patch is to be found there The rayats say it is too troublesome to cultivate, but I doubt rather they do not manage it properly, do not allow the land to lie fallow every foilrth year as was formerly done, and the crop is consequently aban- doned/' (Agri-Hort. Soc. Jour., Old Series, Vol. XL, I.e.) In a more recent report (written by Mr. H. J. S. Cotton, 1876) "on Cotton Cultivation in the Interior of Bengal," the recognition o		SSYPIU M rboreum.
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three names, viz., Boya-bonga, Chengta-bonga, and Bura-muri. ...Mr. Fasson, the Joint Magistrate who drew up the report for the district, says:—' There are certainly two strongly-marked varieties, both apparently G, arboreum, though neither answer the description exactly. The first of these is an erect, ligneous, slender-looking plant, growing six or eight feet high, with three or generally five-lobed palmate leaves; lobes acute, elongated, and lanceolate. The flowers large and showy, reddish pink in colour, with purple claws. The bracts of the outer calvx are cordate-ovate, either entire or obscurely tridentate at the apex; capsules large and three-celled; seeds black, slightly covered with greyish fuzz. The cotton is fine and silky, but of extremely short staple. This variety is called Chengta-bonga or Bon kapas.""

Before proceeding to give Mr, Fasson's account of the second form, it may be here remarked that the above plant would seem to be unmistakeably a form of G. arboreum. The fact of its having leaves sometimes three-lobed, and still further of its being a field crop, would lead •to the supposition, that it may have been but a hybrid of that species with one of the G. herbaceum series, and there would seem no room for doubt, that this is the red-flowered form of G. herbaceum alluded to by many popular writers. But in addition to the colour of the flower, we have the character of the seed and the deeply-cut leaves, with acute elongate, and lanceolate lobes-characters that clearly point to its having been either a cultivated state of G. arboreum or some hybrid with a powerful strain from that species. Whether this form still exists we have no means of saying; but the question of a possible improvement of Indian stock would

GOSSYPIUM arboreum.	
CULTIVA- TION.	seem to hinge upon the possession of all the early forms, and this is one well worthy of being followed up. We turn now to Mr. Fasson's second variety. This is described as having had broader leaves, sub-acute lobes, and more deeply toothed bracteoles, the fruit, 5-celled, the staple less plentiful though longer, and fuz of a grey colour. This is the <i>Boya-Donga</i> , and by Mr. Fasson was thought to be Roxburgh's G, obtusifolium: it was, however, more probably G. neglectum. Mr. Cotton's valuable report, from which the above passages have been abstracted, contains much of great interejt regarding the cottons of Bengal; enough to raise the hoge of possible future good work, but not enough to solve all the obscure problems that involve the subject. In Bhagulpore the tree-cotton grown near the villages is said to have been known as <i>gajer</i> , a perennial which yielded a crop for three or four years. The long-boiled condition of the Garo cotton has led to its being oicen spoken of as a kidney-cotton. It is, however, quite different from G. acuminatum, <i>Roxb</i> , G. vitifolium, <i>Latnk</i> , G. brasiliense, <i>Macf</i> , and G. racemosum, <i>Poir</i> , the kidney-cottons. It has in fact & much closer resemblance to G. peruvianum, for in both the seeds have an under-coat of the wool which holds the contents of the capsule together in a mass, often in the case of the Garo cottons, sportuding to a length of three to six inches. The matted character of the Garo cotton suits it, in an eminent degree, to one of the suproses for which it is employed. In weaving a sort of fluit, teutf of wool from a seed is said to be placed, by the hand, within the weft of the texture and thus firmly fixed, on the upper surface, forming rows which in a dense mass, imitate a thick and crude plush. We have incidentally alluded above to Dr. Hove, but it may perhaps be as well to discuss in this place more fully the inferences to be drawn for the tatter and thus firmly fixed, on the upper surface, forming intow this approbation on the beiget of his mission. He lived fo
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	The Indian Arboreous Cottons.	(Watt & Murray)	GOSSYP1UM
· ·		(Wan & Marray.)	arboreum.

assertion, and he gives no other region as the habitat of the species. Since -the time of Roxburgh, however, no collector has recorded G. acuminatum as found anywhere except in those gardens and farms where efforts have been made to acclimatise exotic cottons. The Calcutta Herbarium possesses specimens dried from plants grown in the gardens. Indeed, G. acuminatum is much less frequently cultivated than G. pemvianum, to which species Royle incorrectly referred Roxburgh's plant. It may, in fact, be said that Peruvian cotton is to some extent cultivated in the Madras Presidency. It is the large-leaved and conspicously flowered species with immense bracteoles, of which specimens have been contributed by several officers in South India. As already remarked G. peruvianum has velvety seeds free from each other, but in foliage, flowers, and bracteoles it much resembles the kidney-cottons.

But Roxburgh, in addition to the three species named, also described O. barbadense (Bourbon cotton), remarking that it had then been only recently introduced. Seeing that Roxburgh practically began to study the cottons of India about the time of Hove's visit, these distinguished botanical pioneers may be said to have found the cotton crops, at the close of the last century, to consist of forms of the plants generally known as G. arboreum and G. herbaceum. Indeed, Roxburgh questioned the former species being ever grown as a field crop, and, as already stated, he appears to have classed the yellow-flowered form (G. neglectum, Tod.) under G. herbaceum. He was, however, in considerable doubt regarding G. arboreum, and probably rightly conjectured that the Cudupariti of Rheede (Hort. Mai, 1., p. 55, t. 31) might prove a distinct species. This Todaro refers to his G. neglectum, but as opposed to this arrangement it may be pointed out that, according to Roxburgh, the most characteristic feature of the Cudupariti is its round fruit, a character which would place it with G. arboreum proper. This confusion may, however, be accepted as indicating a recognition, on the part of Roxburgh, that there were two forms of G arboreum. He does not seem to have entertained the idea that the field crops with " petals tinged with red," and those with yellow flowers but, jyith the foliage of arboreum, might be hybrids of that species, and probably had not seen the red-flowered growths of which Hove wrote. Hove, in fact, found three forms of cotton in Western India, but as his report was not published till 1851, Roxburgh appears to have remained ignorant of Hove's discoveries. The three cottons seen by Hove were—(1) a yellowflowered form which yielded the best staple and was always grown on the lower-lying lands: (2) a red-flowered kind, cultivated on the higher sandy soils which afforded a short but fine staple: and (3) a form peculiar to Kathiawar, which he came across accidentally in a garden. There are many features of Hove's red-flowered cotton that justify the suspicion that it was a hybrid, with a pronounced strain of G. arboreum. He wrote of this cotton in Cambay on the 6th November as then in full bloom with scarlet flowers, and quite another species from the yellow-flowered bush grown at Diroll in Broach, " On my journey," he continues," to Kerwan On Cambay, for the space of 16 miles, wherever I cast my eye, I could *see nothing else but cotton plantations. Where the soil consisted of a heavy clay those districts were planted with the yellow sort, and those which consisted of sand, or were situated higher from the adjacent ground, were planted with the red species." He then goes on to say that in the second year the red-flowered bushes grow to a height of seven feet, but in order to make them bushy and to cause them to yield a large crop, they

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have to be twice pruned,—once when they are only three feet high, the shoots are', then cut down by a foot, and the second pruning takes place after the first crop has been collected. At Desberah in Broach, he was G: 6 13

CULTIVA-TION.

GOSSYPIUM arboreum.	The Indian Arboreous Cottons.
CULTIVA- TION.	 told, the red cotton was known as Dyva Nerma Cap ass. As seen at Sabermatty it had blossoms of a prodigiously large size, not unlike " the Gossypium arboreum on the coast of Guinea." At Sunerwara the red-flowered species was called Semul. One of the most remarkable features of Hove's account of the Bombay cotton cultivation, one hundred years ago, is the stress he lays upon the necessity for free irrigation, with yellow-flowered cotton, which in this respect differs, he adds, materially from the red. The third form of cotton seen and described by Hove was a form from Kathiawar which he saw accidentally. At Hanley village, close to the river Dahder, he came across a solitary plant of this cotton, which, he was told, had come from Junaghar in Kathiawar. The cultivation of this had been abandoned at Hanley because the plant formed so dense a bush as to kill the grains grown between the rows of the cotton plants. It was large ppdded and a more luxuriant plant than either of the former two sorts. Hove expressed astonishment that it had not taken the place of the yellow and red-flowered ordinary sorts. This was explained, however, for it not only suffocated the grains grown with it in the same Held, but " possessed such a sweetness by nature that the insects destroyed the greatest part before it came to full perfection." It was apparently not so destroyed, however, in Kathiawar, for Hove was told that to the merits of this cotton the people of that region owed their reputation of being the most prosperous in all Guzerat. What cotton Hove here alludes to seems open to grave doubt, but it could not have been an American exotic, or he would most probably have recognised it as such. In the remarks under Bombay it will be found Kathiawar is shown to be, even today, famous for many kinds of cotton and some of great merit. In another passage Hove alludes to the roots of red cotton being much more bitter than those of the yellow, and states that in consequence they were used as a medicine for fever
MEDICINE.	MEDICINE. In the above remarks it may have been observed that Dr. Hove is
Root.	In the above remarks it may have been observed that Dr. Hove is quoted as the authority for the statement that in Bombay the ROOT \Aas
7	at his time used in the treatment of fever, as it had the reputation of being more bitter than that of G. herbaceum. Dr. Dymock says that " in the Konkan the root of the <i>Deokapts</i> (fairy or sacred cotton bush), rubbed to a paste with the juice of patchouli leaves, has a reputation as a pro-
Juice of the Leaves. 8	moter of granulation in wounds, and the JUICE of the LEAVES, made into a paste with the seeds of Veraonia anthelmintica, is applied to eruptions of the skin following fever. In Pudukota the leaves, ground and mixed with milk, are given for strangury." In the United States Dispensatory the bark of the root of G. herbaceum and other species is officinal.
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	OSSYPIUM arbadense.
SPECIAL OPINION.—§ "The PETALS of the red cotton flower, squeezed and soaked in human or cow's milk, is used as a soothing and effective application for conjunctivitis of infants." <i>{Surgeon-Major Thomson, M.D.,</i> <i>C.I.E., Madras</i>).	MEDICINE, Petals, 9
II. Gossypium barbadense, <i>Linn.; Ft. Br. 2nd.</i> , /., 347.	-
11. Gossyphum bar badense, <i>Linn.</i> , <i>Ft. Br. 2nd.</i> , <i>f.</i> , 547. THE AMERICAN COTTONS. For the purpose of the present article, all the American cottons are treated of collectively, but those only in any degree of detail, that have been successfully acclimatised in India. The New World cottons are re- cognised by most authors as the forms with broad (only half-segmented) leaves and ovate obtuse, deeply laciniated bracteoles. The leaves in the great majority are sub-glabrous, those of typical Asiatic origin being very hairy. Todaro puts little faith in the specific value of the under-coat of tofhentum, which clothes the seed (in many forms of Gossypium), but it seems highly probable that that peculiarity was originally confined to Asiatic cottons. The further peculiarity of a series of cottons having the seeds mechanically united into a kidney-like mass would, on the whole, appear also to belong to certain American cottons. The species here viewed as of more immediate American origin, were, at the time of the dis-	10
covery of America, found in a state of cultivation from the West Indies to Peru and from Mexico to Brazil.	
The geographical distribution of the series, according to Humboldt, is from 0° to 34° of latitude, or where the annual temperature ranges from 82° to 68°. The several forms, races, or hybrids, of this assemblage, vary greatly in external characters and commercial value, though botanically it may be doubted how far it is desirable to isolate as species the forms recog- • nised as of pure (not hybrid) origin. Generally speaking, the staple im- proves with proximity to the sea, but it cannot be said that there is any fixed ratio of variability to climate or position within the area of distribution. Thus the cotton of Demarara (14° south) is fairly good, that from Jamaica (20° north) bad, while the cotton of Georgia and Carolina, nearly at rfhe most northern limit of the area, is very superior. Commenting on this variability Royle says, "It would appear, therefore, that not only is tem- perature necessary to be considered, but also the due balance between the supply of moisture to the roots and its escape by the leaves, as well as all the varied processes of a judicious culture in addition to the choice of species or variety to be cultivated in any particular locality." Dr. Maxwell T Masters {Jour. Linn. Soc ₉ XIX., 213) has given an entirely new turn to the enquiry into the so-called American cottons. A manifestation apparently of this type is, he says, the prevailing one in tropical Africa. It has been found, he affirms, by African travellers, in a state of cultivation near lake Nyassa, along the Zambesi, Shire, and the Rovuma valleys, near lake Tsad, in Abyssinia, and on the Somali coast. On the western side of the continent and adjacent islands it is also the	

species principally cultivated. Along the Nile valley, however, extending aiv far as Khartum, G. herbaceum, Dr. Masters states, is the form usually grown. He further describes a new species of Gossypium (G. Kirkii) which, there would appear to be no doubt, is a truly indigenous wild African form. It is interesting to notice that Dr. Masters regards G. Kirkii and G. anomalum as the only truly wild African forms and makes

no mention of G. arboreum. On the other hand, DeCandolle (*Origin Cult PL, 40*\$) writes of G. arboreum :—" It is a native of tropical Africa and has been seen wild in Upper Guinea, in Abyssinia, Sennaar, and Upper

Egypt. So great a number of collectors have brought it from these countries that there is no room for doubt, but cultivation has so diffused

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een described under several dolle appears to favour the ncient writers, was probably gypt. But he adds, "The nd transported into different ne tree-cotton which yields a ree in thinking all the truly r Nankin colour. The de- of British India, may also or acclimatised condition of ng the original wild state of an authentic specimen of G.
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bove explanation authorita- isation may have to account loubt, .indeed, it is by no and American cotton is pos- vided in their opinion. The perican cottons, a theory fa- Stocksii, would be the exist- um, possess certain of the pe- tons—a series of Gossypium he Old Worlds. merican cottons may be said leaves are in fact often only e lobes broad and often* sud- not rounded, and never pos- is in outline are almost obtuse, yle kept the kidney or Per- orgian, and Bourbon. From nore natural course to do so, deeply segmented, the seeds her in a kidney-shaped mass,
, see p. 26). DF COTTONS. that given by Todaro, but, as rms to be hybrids rather than the Roxburghian form of G. at was probably the Linnean jority of the American forms Magnibracteata.or those with ated, and in which the seeds signs to his 6th section, Syns-
ion //., see p. at.) //. sees several species, two, t>* are: — , with 3 to 5 triangular, acute or acu-
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G	OSSYPIUM
The Barbadense Series of Cottons. {Watt & Murray,) ba	arbadense.
This is generally known as Nankin cotton. (Con/, with pages 29, 31, 79, iL2, 130, 134-135-) According to Roxburgh it is closely allied to G. hirsutum, and by Todaro the Indian Nankin plant is placed under that species and apart from G. religiosum, Linn. Roxburgh appears to regard it as having come to India from China. Its peculiarities may be said to be those of a cross between the typical American and Asiatic forms, probably a hybrid which took its birth in India or China. (Cottf. with G. nanking, see p. 290	CLASSIFICA- TION.
but it is feared the existence of <i>khaki</i> -coloured forms of all the Indian species and hybrids, has tended to destroy the advantages that might have been expected to accrue from the careful cultivation of this plant. It seems at least probable that any brown or reddish-brown cotton has been accepted and cultivated as Nankin and hence called G. religiosum, whereas the Selection and development of white qualities of G. religiosum, <i>Roxb.</i> , might prove of great value, but of course apart entirely from the craze for " nature-dyed <i>khaki</i> cotton." (2) Gossypium mexicanum, <i>Tod., Cult, dei Cot. 193, t. VI.</i>	14
 (2) GOSS prim mentation in the road, four, active out 195, it is the MEXICAN COTTON. DIAGNOSTIC CHARACTERS.—Shrubby, hairy, ultimately glabrous. Leaves, deeply cordate, sub-rotund, one-half cut into 3-5 lobes, lower pair very obscure; lobes oblong, triangular, acute or acuminate; stipules deciduous. Flowers, small, yellow or with a purple flush; petals obliquely truncate, often with a very small circular purple spot; bracteoles sub-equal with the corolla, broadly ovate, base rounded or slightly cordate, deeply laciniated. Capsule, small, rotund, slightly acute, 3-4 celled: seeds small, truncate, velvety underneath the floss; fuzz short, deeply rusty-coloured, floss long, pzfte reddish white. It seems probable that this may be the species with small pale-coloured flowers alluded to by certain writers on Indian cotton. Dr. Wight contributed to the Agri-Horticultural Society of India two long papers on Mexican cotton. These will be found in the Journals (Old Series) VI., 189-196; in his second paper he gave the results of experiments with this cotton in the various provinces (jour., Old Series, VII., 194-215). In a still earlier issue (Journal, Old Series, Vol. I., 25-34), Dr. Spry gave it as his opinion that Mexican cotton was admirably suited to Behar. 	
 that Mexican cotton was admirably suited to Behar. B. Capsule large, leaves nlso large and palmately lobed. There are many more forms described by Todaro under this series than need be here dealt with. The following are the more important— (3) G. hirsutum, L. SAW-GINNED DHARWAR COTTON : NEW ORLEANS COTTON : UPLAND GEORGIAN : BAMIA, &C, &C. References.—Roxh., Fl. Ind., Ed. C.B.C., \$ar; Royle, III. Him. Bot., /., 100; Parl. Sp. Cot., p. 41, tab. V.; Gossypium album Ham. in Linn. Trans., XII., p. 482; Wight & Am., Prod., Fl. Ind. Or., I., 54 (exparte); G. barbadense, var. Upland Georgian, Royle, Cot. in India, p. 148, pi. HI.,/' 4; G. barbadense, var. C>, Wight. III. Ind. Bot., 84, tab. 28; G. herbaceum, var. 2, hirsutum, Masters, in Fl. Br. Ind., '., 347; AgriHort. Soc, Ind., Trans.:—II., 61-63, '50, 151, 3\$9, 403; III, 7, *33, t\$r, 138-189, 212; V., 52, 183; VI., 107, no, 113, 230, 246; VII., App., 13, 14, 22; VIII., 226, 244; Journals.—(Old Series), I., 187; II., Set., 2, 321, 485; III, Proc, 67, Sel. 262; VI., 119; X., 211; XI, 588; XII., ij8, '79, 21s, 220, 223, 225, 234, 243, 255-260, 263; Proc, 42; XIII., 89, 155, '57 (Pro. 1864), 30, 38. DIAGNOSTIC CHARACTERS.—The description of the Indian form of this plant, as given in Roxburgh's Flora India and the Flora of British India, may be expressed as:—shrubby, tender parts and young leaves softly hairy and of a pale moss green. Leaves, 3-5 triangularly lobed, being cut to one-half their depth. Flowers, large, yellow or yellowish white without a purple spot; bracteoles deeply laciniated, obtuse. Capsule rounded ovate, 4-celled, apex rounded then terminated with a short beak, seeds free, down, firmly adhering, green or grey, cotton, white, fine, and long. 	Conf. with p. 130. 15
² G. 15	

GOSSYPIUM	The American Cottons
barbadense.	
CLASSIFICA- TION.	This species varies greatly in the thickness and colour of its velvety coat (on the seeds) and also in the length and fineness of the staple. Roxburgh wrote of it: "This green-seeded variety has only been of late introduced into India, where the cotton is much admired by the natives." During the past fifty years, however, the cultivation of this cotton has gra- dually concentrated in the Deccan. It is of course also met with in other parts of India, but success has chiefly attended its acclimatisation in Dharwar and the neighbouring districts; the cotton is known in the trade as Saw-ginned Dharwar. This has come by many writers to be spoken of as a form of G. herbaceum, and indeed in the <i>Flora of British India</i> , it appears as a variety of that species. In foliage, flowers, bracteoles, and cotton, how- ever, it clearly belongs to the American series. In the velvety seeds and strong tendency to wooly stellate pubescence on the leaves it manifests an approximation to the Indian cottons, which may be due to hybridisation. Indeed, in the Sutlej Valley, near Sum', a form of G. hirsutum occurs which appears a hybrid. It is there known as <i>Nurma</i> , and its flowers are often quite pink. This is almost identical with the Sahet kaskom cotton of Santal country.
16	Egyptian cotton, at least the plant so called in India, is apparently a peculiar form of G. hirsutum, which in some districts has shown itself fairly suited to this country. Bamia cotton (once, though erroneously, said to have been a hybrid between ordinary Egyptian cotton and Hibiscus esculentus), is, according to Todaro, a hybrid between the Egyptian form of G. hirsutum and G. maritimum—Sea Island cotton. By cultivation in Italy Todaro found that it rapidly reverted to the latter species, never to the former. In Egypt, Sea Island cotton is perhaps grown to an equal extent withftew Orleans. The Bami race, which appeared spontaneously, establishes be- yond all doubt, therefore, that the American series of cottons hybridise amongst each other. Further, if G. hirsutum be itself accepted as a hybrid, it might even be inferred, that it originated from G. maritimum with some plant belonging to the G. herbaceum series, since Bamia reverted to the admitted specific ancestor, G. maritimum, never to the doubtful specific form, G. hirsutum. Indeed, on this line of reasoning, it might still further be assumed that the failures recorded in the effort to fertilize New Orleans with Indian cotton, were due to the G. herbaceum ancestor of New Orleans being distinct from the Indian cotton, or to G. maritimum being the stronger element of its hybridisation, towards which it would readily pass by further crossing or by continued cultivation.
16	 (4) Gossypium maritimum, Tod., Cult, dei Cot., t. VII., p. 225. [Egyptian]. SEA ISLAND COTTON; (Bamia, a hybrid between Sea Island and ^R^e, rence, est, a barbadense, var. Sea Island, Royle, Cotton in India, 146, tab. III., fig.3; Wight, III., PI.28B.; Gossypium barhadense, Far I. in Sp. dei Cot, 83, tab. III.; G. barbadense, Masters, Fl. Br. Ind., I., 347 (non-Linn.); Bent. & Trim., Med. PI. (an excellent plate), G. barbadense, No. 37; AgruHort. Soc. Ind. Trans., II., 148, 152, 307, 300, 403 / //., T, A., 201; A.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, A.J., 201; A.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.J., 588 ; XuII.; Set. 88. (OITSJIEAT; fa »Q., d03 / //., T, S.S., stater a subcordate, less than one-third cut into 35 lobes, or only angled, the upper ones entire; lobes ovate to lanceolate, oblong, acute, sinus almost condate, subcordate, less than one-third cut into 35 lobes, or only angled, the upper ones entire; lobes ovate to vate-conic, acute, 3-4 locular, 6-9 Kcording to Todaro there are three varieties or rather hybrids of this species; viz., jumelianum, degeneratum, and polycarpum. Only the lastmentioned need be discussed in this place, but in passirg it may be said G. 16

	The Bourbon Cottons. {Watt & Matt	117770111	
In the Journal of the Agri-Horticultural Society of India (New Series), Vol. VL, pp. 72 ^m 73 and 177-193* in the last-quoted passage, Mr. C. L. Tupper (then Under-Secretary in the Revenue and Agricultural Depart- ment), gives a review of all the experiments conducted in India with the vhw of acclimatising Bamia cotton.) Gossypium barbadense, Linn.: Todaro, Cult dei Cot, 234. ¹¹ A fairly good representation of this plant is the unpublished engraving in the India Office Museum collection, bearing the name G. barbadense. This form may possibly be the chief source of the so-called Bourbon Cotton of India. References.—AgriHort. Soc. Ind., Trans. II., ///., i32; V., 183: VI., 23,238', Jour. (Old Series), I., 187. DIAGNOSTIC CHARACTERS.—Todaro, while insisting upon the separation of Conf. with	that Bourbon cotton, which we are told was introduced into Indi belongs mainly to one or other of the forms of this species, or as some writers, to G. barbadense. The term Bourbon is in fi- generic in its significance—at least it is not specific, but inclu- widely different flosses. For many years * Heath's cotton/ Bourbon, found a ready market. It was seemingly the same p yields the staple, known up to the present day, as * Salems.' (7 is referred to the provincial section of this article which deals of Indian cotton, pp. 102-104.) G. maritimuni var. polycarpum, Tad., t. VIII., is the hybrid alluded to which affords the Egyptian cotton known as Bamia. already stated, is viewed by Todaro (Cult., dei Cot., pp. 36-37) as between ordinary Egyptian cotton (one of the forms of G. hirs Sea Island cotton—G. maritimum. While admitting, however is* the nature of the plant in question, Todaro assigns it the po- variety. He defines it as stem rigid, erect, rarely branched; peduncles 1-3 in each axil, the lower one bearing one to two f his introductory chapter Todaro contends that Bamia cottor culturally speaking, very interesting, because, not being branc plants can be grown on a given space, and since more than on formed at each node, the yield is very great. Cultivated in Ital soil, it lost, however, all these advantages and assumed the ord of Sea Island cotton. In a like manner the condition whic designates as variety degeneratum was found naturally produced containing New Orleans and Sea Island, but the seeds were not fertle to allow of its being cultivated for many years. Before dismissing the subject of Bamia cotton it may be that an extensive Inäian official correspondence was conducted, f the year 1877, on that subject. Large supplies of seed were obtain plant was experimentally cultivated in every province of India few years all interest ceased, and it is not known to what extent Bamia cotton is now grown in India (see Proceedings, Revenue cultural Department—Papers on the Experimental Cultivation cotton in India	ia in i8o4> ccording to cact almost udes many a form of olant which The reader with South id already this, as as a hybrid sutum) and c, that this osition of a ; flowering lowers. In n is, agri- ched, many ne flower is y, on poor linary form ch Todaro d in a field sufficiently remarked from about ned and the n, but in a t (if at all) and Agri- of Bamia 26, a short hybrid be- Str J. D. han a well- f Egyptian Gossypium rred. The	OSSYPIUM arbadense. CLASSIFICA- TION.
¹¹ A fairly good representation of this plant is the unpublished engraving in the India Office Museum collection, bearing the name G. barbadense. This form may possibly be the chief source of the so-called Bourbon Cotton of India. References.—AgriHort. Soc. Ind., Trans. II., ///., i32; V., 183: VI., 23,238', Jour. (Old Series), I., 187. DIAGNOSTIC CHARACTERS.—Todaro, while insisting upon the separation of Conf. with	In the Journal of the Agri-Horticultural Society of India (Net Vol. VL, pp. 72^m73 and $177-193^*$ in the last-quoted passage, I Tupper (then Under-Secretary in the Revenue and Agricultura ment), gives a review of all the experiments conducted in India vhw of acclimatising Bamia cotton.	Mr. C. L. al Depart-	
23,238', Jour. (Old Series), I., 187. DIAGNOSTIC CHARACTERS.—Todaro, while insisting upon the separation of Conf. with	$_{tl}$ A fairly good representation of this plant is the unpublished in the India Office Museum collection, bearing the name G. ba This form may possibly be the chief source of the so-called Cotton of India.	arbadense. I Bourbon	17
	23,238', Jour. (Old Series), I., 187. DIAGNOSTIC CHARACTERS.—Todaro, while insisting upon the ser	paration of	

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GOSSYPIUM barbadense.	
CLASSIFICA- TION. Conf. with p. 152.	were the words used by Linnaeus in his descriptive designation of G. barbadense, Linn., which very probably included G. maritimum. Todaro contends,' however, that the confusion regarding this species is mainly traceable to Swartz, who de- scribed cultivated plants and says that in Barbadoes, there is a Gossypium with a three-lobed leaf corresponding closely to the Linnean type, and which could not be included with G. maritimum. He therefore regards the Barbadoes plant as very possibly G. barbadense, Linn. This argument is strengthened, he thinks, by the fact that Sea Island cotton (G. maritimum) was not cultivated in the West Indies at the time Swartz wrote. After a critical inspection of all the plates cited, and a careful considera- tion of the meagre literature of these two plants as separated by Todaro, we do not think that they are likely, in the future, to be retained as distinct botanically. They are doubtless, however, worthy of separate recogni- tion, since they yield commercial forms of cotton, and thus, both agricultur- ally and commercially, are of interest. G. maritimum, <i>Tod.</i> , is an anfual plant, largely cultivated, while G. barbadense is perennial. We possess samples from various districts in Western and Southern India, that appear to be the G. barbadense, <i>Linn.</i> , accepted as such by Todaro. Dr. Prain has also kindly allowed us to inspect a specimen of it which he collected in the Andaman Islands on Mount Harriet. It was there found in an arboreous condition and apparently quite naturalised [*] It seems highly probable that this is, to a large extent, the G. barbadense, <i>Roxb., FL Ind., p. 521</i> , which, he says, had been introduced into India about the beginning of the century from the Island of Bourbon—hence its com- mercial name of Bourbon cotton. His memak regarding its introduction firms Todaro's statement of its having been originally a native oi these islands. There are, however, one or two difficult points regarding Rox- burgh's Bourbon cotton. It is described as having "leaves smooth, wit
	Cult, Cotton in Jnd., PI. III., 7. 2) under the name of Bourbon cotton, has the broader, less segmented leaf of G. barbadense, but the 5-lobed condition of G. maritimum.
18	 (6) Gossypium peruvianum, Cav.; Tod., Cult, del Cot, 240. PERUVIAN COTTON[^] This is said by Todaro to be a native of Peru, and to be cultivated in Spain. We have seen one or two samples of it from various parts of India— notably a good sheet from the Madras Herbarium. This was apparently cultivated at Triplicane by Dr. George Bidie, O.I.E. In foliage and bracteoles it much resembles G. acuminatum, Roxb., but the stipules are very large, being fully.an inch and a half long and the leaves thicker, smaller, and the segments more constricted at the base than in G.
	G. 18

• 'The Kidney Cottons. (Watt & Murray)	GOSSYPIUM barbadense.
vitifolium and G. brasiliense—the kidney cottons—with which it was confused by Royle and, following him, by many Indian popular write. This same mistake has also been made by Masters (<i>Flora of British Ind</i> /., 247) where G. peruvianum, <i>Cav.</i> , is quoted under G. acuminatum <i>Roxb.</i> , a plant which, at the same time, is reduced to a variety of barbadense. Peruvian cotton has the seeds free from each other and coated with thick velvet below the floss. It is thus either a distinct species (and that case a native of Peru) or a Peruvian hybrid between one of the kidne cottons and some of the forms of G. herbaceum. The very large flower and immense deeply gashed bracteoles are its most ready eye-marks wh taken in conjunction with the fact of the seeds being free from each other Mention is made of this cotton in several of the reports, &c, which de <i>With</i> the introduction of American cottons into India, notably in connection with Orissa. (See <i>Trans. AgriHort. Soc. Ind.</i> , <i>II.</i> , 5/.)	rs. TION. <i>ia</i> , m, G. a in ey ers en er. eal
II. SYNSPERMIA. (For Section I, see p. 16.)	10
Seeds adherent into a mass—hence the name kidney-cottons. Toda describes eight species under this section, and three of these are met wi in India. There are several very obscure points regarding these plan and, so far as the forms met with in India are concerned, it seems dout ful if they deserve a higher rank than that of varieties, if, indeed, th should not rather be accepted as cultivated races of one species. Ro burgh was the first to describe the plant now known under the nar G _n acuminatum. Regarding the habitat of that form he wrote, "said* o a native of the mountains to the north and westward of Bengal." B the exact location of the region there referred to is extremely difficult, if n impossible. Nepal would perhaps be on the north-west of Bengal as no understood, but if Behar be excluded from Bengal, Roxburgh's senten would then indicate Bundelkhand or thereabouts. But, it should be o served, he gives no exact locality, his words being "said to be a nati &c." It thus seems highly probable that Roxburgh described his speci- from plants raised in the Botanic Gardens, the information given abo being the report furnished to him by his native gardener, who, perhaps, pr cured the seed from some of his friends as that of an interesting ne plant. It is not like Roxburgh's work generally to leave so obscure passage, if it had been in his power to be more precise. Royle (<i>Illustr</i> <i>tions of Himalayan Botany, 98</i>) republished Roxburgh's description at habitat of this species, but apparently had not seen an example of th plant. He, however, described it as distinct from G. vitifolium and for G peruvianum. In his later work (<i>Cult, and Com. of Cotton in India, 14</i> he reduced all the kidney-cottons, including G. acuminatum, <i>Roxb.</i> , to of peruvianum, <i>Cav.</i> —a reduction due very probably to the misconception of viewing G. peruvianum as kidney-cotton. While we cannot accept th part of Royle's work, as remarked above, we consider G. acuminatum, <i>Rox</i> g, vitifolium, <i>Lam. (non Roxb.)</i> , and G. brasiliense, <i>Macf.</i> , as d	ro ith ts, bt- ey x- ne be but iot ww ce b- ve es ve o- ww a a- nd he m 0) G. of is b; ly as is rt p, he b; ly as y- p, he b; b; b; b; b; b; b; b; b; b;

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ould be referred to G. acumi- orasiliense, <i>Mac/</i> . Mr. J. F. ry possibly G. acuminatum, a but in a state of cultivation of wild G. acuminatum.
\$20. Wight, III., t. 27: Royle, III. India (in part), IV., 149; G. FI. Br. Ind., I., 347 {ex. certain 149. Leaves, 3-5 lobed, lobes divergent, lowers large, bracteoles broadly psule ovate, acuminate, cells 8-10 & a, Roxb., written by Dr. N. this thrown on the report, ori- es being possibly a native of ing seeds and samples of and February last by Major first discovered the tree pro- rds met with several others cuminatum, and says, it is re- north-eastern parts of Bengal heard it asserted confidently, tree 12-16 feet, and is very a very peculiar manner; the k-white, and of a long staple, se, Macf., it will be found that assage just quoted, attributes minatum was a native of the engal. Waflich further states "some other parts of Hindus- tward of Bengal." WaMich's me from Surinam in Guiana en confirmed by all subsequent ly satisfied that all the kidney- ase G. acuminatum would pro- of the western types instead
V., &91. 13. V., tab. XII., fif. 1. + France and, to some extent, in pecies is, by many writers, con- e two plants have nothing in leaves hairy below; the upper ceolate, acuminate. Medly mentioned in the various peared on the introduction of re given of the cotton produced,

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·	Pernambuco or Brazilian Cotton. (Watt & Murray.) GC	DSSYPIUM
	ba	rbadense.
which it may now of its being figure	aper can be found on the subject, so that the extent to v exist in India cannot be discovered. But, from the fact of by Rum phi us in 1750, we may infer that it was, per- earliest forms of kidney-cotton which found its way to	CLASSIFICA- TION.
(9) Gossypium bras	siliense, Mac/, j Tcdaro, Cult, dei Cot., 265.	22
PERNAMBUCO	OR BRAZILIAN COTTON.	
References. Com. Co 124, 1269, VII., App 89.	—G. religiosum, Parl. (in part, non Linn.); Royle, Cult. & otton in India, 152; AgriHort. Soc., Ind., Trans., 11., 55, 4 146, 147; ///., 39; V., Sh 54-5*, Proc, 39; VI., 100, n6,i3r; 5. 14; Journals (Old Series), I., 187; IV., 207; XIII., Sel.	
9-7 lobed, with the s *(or, according to so ably from the bracte acuminate, shorter the long wool.	ARACTERS.—An extensively branched bush. <i>Leaves</i> very large, inus thrown up as a fold between the lobes. <i>Flowers</i> large, yellow ome writers, with a purple base), convolute, protruding consider- oles, which are very large and deeply laciniated. <i>Capsule</i> ovate than the bracteoles, cells 7-9 seeded; seeds naked except lor	
with in India. O near temples, tak official correspond mention is made o "it was found g specimens could might produce, if of the plant." T Commerce at Bon cotton is much st American cotton, resembles Brazilia are told of other s which had been f further samples of on these samples Island and 8 to S ⁴ Pernambuco stock apparently asked in the official corre the pen of that d Roxburgh's "G. and east Bengal." as already stated, indigenous to Indi Mr. Scott, the co or closely allied th adherent to each resembling G. acu > with free seeds. natum have not be has distorted the that Roxburgh's "G of this species—on has become practic	probable that this is the chief form of kidney-cotton met one or other form occurs very frequently in gardens and ing the place of G. arboreum of former times. In an lence conducted in 1871, regarding the Nicobar Islands, of a very superior cotton. Colonel Man wrote that growing in an almost wild state, and, therefore, the only be taken as a slight evidence of what the island 'skilled labour and care were devoted to the cultivation he samples furnished were forwarded to the Chamber of nbay, and the report on them was to the effect that " the uperior to any grown in India. It is also superior to , except the fine Sea Island description. It greatly an cotton both in colour and in staple." Later on we amples of Nicobar cottons grown from Sea Island Seed, furnished by the Secretary of State for India, as well as f what is called " the indigenous cotton." The report gave a valuation of 20 to 24^. per pound for the Sea ' <i>d</i> . for the indigenous. The latter was pronounced to be k of •« good useful quality." Mr. C. B. Clarke was , however, to examine the plant, since a report exists espondence (No. 329, dated 21st February 1871) from listinguished botanist in which he says it is probably . acuminatum, a plant indigenous in the hills of north It is not known upon what this statement is based, but, we have no proof at present of any kidney-cotton being a. Mr. Clarke further makes, on the authority of the late ontradictory statement that it "cannot be Pernambuco ereto, because in Pernambuco the seeds (while similarly other) are covered with grey wool." The species minatum with velvety seeds is G. peruvianum, a plant Thus while Roxburgh's remarks regarding G. acumi- en confirmed by fresh collections, each succeeding writer original statements regarding it. It seems probable G. acuminatum may be but a smaller-leaved condition te with thicker more rotundly palmate leaves, and which cally acclimatised in India. Under the provincial notices isional mention of kidney-cotons, and the reader might,	

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COSSUPILIM	
barbadense.	The American Cottons*.
CONCLUDING REMARKS. 23	Concluding Remarks regarding the American Cottons. , To give even the briefest review of the numerous experiments which have been performed, to indicate the purposes for which large sums of money have been spent, or to exhibit the true force of the disappointing reaction, consequent on the fulle efforts to acclimatise these cottons in India, would occupy many pages. Suffice it to say that neither money nor labour have been spared, but nearly everywhere the same conclusion has been ar- rived at, <i>vie.</i> , failure. In one or two localities, however, fairly good results have been obtained, and the Saw-ginned or New Orleans cotton of Dharwar may be said to be the practical outcome of a half century's energies, on the part of the public, the Agri-Horticultural Society of India, and the Govern- ment. Scattered throughout India may now be found the depauperated sur- vivors of all these attempts at acclimatisation, some practically naturalised but others preserved as mere garden curiosities. It may be stated that fhe final verdict has been pronounced, <i>vis.</i> , that, if seed could be annually pro- cured and of good quality, many of the American cottons might be culti- vated in India, but that they all rapidly lose their special merits when grown from Indian-produced seed. Even the Dharwar exotic, though in some respects a superior cotton to many of the indigenous growths, is a sadly degenerated stock from the New Orleans of America and Egypt. What influence, if any, hybridisation of Indian with American or American with Indian may have exercised in this degeneration it is impossible to tell, but, as repeatedly urged, it would seem to us that the natural direction of future experiments should be in the hybridisation and selection of superior qualities from indigenous or naturalised stocks rather than further efforts at Accli- matisation. The first step towards this end is, of necessity, the acquire- ment of detailed scientific knowledge as to the forms of cotton that now exist in India; the second, the establishment of the
	ciety of India, chiefly from the pens of Drs. Wight & Spry, and in the
	Dr. Forbes Watson writes on this subject:—" With regard to improve- ments in selection of seed and in cotton cultivation generally, no per- ceptible progress has been made, in spite of incessant efforts during the past fifty years. The system of Government cotton farms adopted /or years seemed as if specially devised to render abortive the services* of some of the zealous agents employed at them. The plan under which a certain number of acres was for a season taken over from the rayat and appropriated for experimental purposes, the locality of the experiments being shifted from year to year, made it perfectly impossible to attempt any consecutive experiments as to improved methods of cultivation, rota- tion of crops, or improvement of the plant by selection, such as could be carried out at a permanent agricultural experimental station, of the kind to be found in hundreds on the Continent and in the United States, and in

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The	HerbaCeum	series	of Cotto	s. (Watt & Murra	y.) GOSSYPIUM herbaceum.
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CONCLUDING which the cultivation of cotton could be combined with experiments on the general agriculture of the country, with the progress of which the improvement of the cotton staple is indissolubly connected. There appears to be a natural adaptation of the Indian cotton plant to the dry climate of India, which enables it, by means of its long tap-root, to draw sustenance and moisture from greater depths of the soil than is the case with the American variety, with its number of lateral roots spreading near the surface. Hence it is quite as important to proceed with experiments in the improvement of the native staple by selection, as to attempt the introduction of foreign varieties which, whatever their advantages may be, are not so well adapted to sustain the frequent seasons of extreme drought occurring in India.

It may be remarked that there is less reason now than appeared some time ago to apprehend a serious diminution of the Indian cotton trade through the increasing competition of American cotton. The Indian cotton is not only finding a new and rapidly increasing market in India itself, but it also has taken a firm hold of the continental markets, and it is possible that the appreciation of the merits and the extensive use of Indian cotton by the continental manufacturers may be one of the causes which enable them to compete so successfully as they have done of late with the cotton manufacturers of England, among whom the use of the Indian cotton has declined in a very marked manner. It is also due to this continental competition for Indian cotton, that its market value has of late approached more nearly to that of the American than at any previous period.

Finally, the competition of the American cotton is not the only circumstance which regulates the cultivation of cotton in India. Unless the prices should fall much below even their present level, cotton will continue to be largely grown in India, as over a large part of the country it enters into the regular rotation of crops, and being at all times readily convertible into money, is relied on by the rayat to produce a large portion of the cash required to meet the Government rent and other payments. So long as no convenient substitute is discovered which can replace it in this? respect, the cultivation of cotton is in no danger of falling much below its present extent. It may be remarked, too, that a period of low prices is much more favourable for the introduction of reforms in the cultivation and preparation of the cotton, than a period of high prices, in which there is a good demand for the most inferior descriptions which can be brought (Report on Cotton Gins, Pt. /., 30-31.) into the market."

III. Gossypium herbaceum, Linn.; FL Br. bid., /., 346.

- **Vern.**—*Rut*, *kupds* (the floss), HIND.; *Kapds*, *tula*, BENG.; *Rut*, (the floss), PB.; *Vaunt*, SIND.; *Kapas*, *rui*, BOMB.; *RU*, *kapds*, Guz.; *Kapds*, DECCAN; *Vun-paratie*, *paruti*, TAM.; *Pauttie*, *edudi*, *paratti*, *paritt*, TEL.; *Wah*, *wa*, BURM.; *Karpasi*, *karpas*, SANS.; *Kurtam ussul*, ARAB.; *Pambah*, PERS. NOTE.—It seems probable that most, if not all of the above neurose are those given to the word, not the plant. not all, of the above names are those given to the wool, not the plant. Some racial names for the various cotton crops will be found in the provincial chapters and in the remarks under Gossypium arboreum, pp. 8–14.
- References.—Roxb., Fl. Ind., Ed. C.B.C., sr9; DC, Orig. Cult. PL, 402-405; Sir W. Elliot, Fl. Andh., 157, 146; Irvine, Mat.'Med. Patna, 88 / Medical Topog., Oudh, 6; Mat. Med., S. Ind. (in MSS.), 40; U. C. Dutt, Mat. Med. Hindus, 303; Dymock, Mat Med. W. Ind. 2nd Ed., 109-112; Birdwood, Bomb. Prod., 3if; Baden Powell, Pb. Pr., 477-416; Drury, U. PI. Ind., 229 234; Atkinson, Him. Dist. (lot. X., N.-W.P. Gas.), 738; Useful PI. Bom. (Vol. XXV., Bomb. Gas.), 215, 228; Royle, Prod. Res., 312-355.* Fibrous PL, 264: Cult, and Com. Cotton in India, many passages; Manual and Guide, Saidapet Farm, Madras, 17, 59-0/; Ltotard, Mem. Paper-making Mat., 24; Shortt, Man. Ind. Agri., 192: Lin schot en. Voyage to East Indies (Ed. Bur-Man. Ind. Agri., 192; Lin schot en, Voyage to East Indies (Ed. Bur-

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REMARKS.

GOSSYPIUM herbaceum

CLASSIFICA-TION. The Asiatic series of Cottons.

nell, Tiele and Yule), Vol. /., 55, 60, 95, 129; Hove, Jour, of Tour in Bombay in 1787, pp. 26-27, 29, 30, 34-35* 36, 37-38, 39* 40-4'» 4h 45, 58, 69, 76, 81, 106-107, '09, M27, 131-132, J49-149, i55-*5t> *58, 161, 167, 169 / Man. Madras A dm., Vol. I., 289-290, 334, 335, 339; Nicholson, Man. Coimbatore, 232-235; Gazetteers and Settlement Reports too numerous to be quoted; Indian Forester, XII., app. 7; XIV., 109.

To prevent any possible misunderstanding, it may again be explained that we use the name G. herbaceum, as the most convenient for a series of forms, one of which (G. Wightianum, *Tod.*) may be of specific interest, but the others, while entitled to lower positions botanically, are nevertheless equally valuable as races of cultivated cotton. Todaro appears to have established one or two important facts regarding these cottons, and these may be briefly summarised :—(1) G. herbaceum *proper* does not occur in India, and indeed the attempts at introducing it have been less successful than were those with the American cottons : (2) The bulk of the commercial cottons of India are hybrids : (3) The species of greatest importance to India is G. Wightianum, *Tod.*: hybrids from that species constitute the better cottons of Western and Southern India : (4) G. neglectum, *Tod.* (a form of G. arboreixm, according to many authors, and of G. herbaceum by others), also occurs in India, and hybrids from that species constitute the bulk of the cottons of the Eastern and Northern divisions of India : (5) Two varieties of G. herbaceum are found in India, *vis.*, obtusifolium and microcarputn. The former is met with chiefly in Bengal and Madras, and the latter is largely the source of the *Dhollera* cotton.

As already remarked under G. arboreutn we regard many of Todaro's forms of this species as mere hybrids, but it may serve a useful purpose to give here the names of the species or hybrids to which we allude and to suggest their possible nature.

III.

{For /. see page 7, and for II., page 16.)

kTHE HERBACEUM OR ASIATIC SERIES OF COTTONS,

25

Habitat.—This form, Todaro says, is a native of Asia, and perhaps also of Egypt. Accepting G. Stocksii as a wild form of it, he gives also the rocks of Sind as one of its habitats, thus extending the area to India. As far as we can judge, the original home of G. herbaceum may have been to the North-West of India proper, corresponding more nearly with the region of its present cultivation, *viz.*, Egypt, Asia Minor, Northern Africa, and Southern Europe. Although now extensively cultivated in the United States, it was probably introduced there from Europe. It was a new cultivation, DeCandolle remarks, one hundred years ago, since in 1774 a bale from North America was confiscated at Liverpool on the plea that the cotton plant did not grow there, but there is probably little or nothing to support DeCandolle's appropriation of that circumstance as a historic fact specially connected with G. herbaceum. It would seem simply to prove that America up to that date was not known to produce cott«n. We know, however, that the G. barbadense series of cottons had been grown there from time immemorial by the aboriginal tribes long anterior to any record of the introduction of G. herbaceum. It would appear also that the incident alluded to by DeCandolle took place in 1784 not 1774.

Todaro, however, admits two varieties as met with under cultivation in India, and if our suggestion proves correct, *viz.*, that even G. Wightianum may be but a hybrid or sport, or at most a variety, of G. herbaceum, *Linn.*, India, as commonly reported, might then be accepted as one of the chief habitats of the species. If, on the other hand, Todaro's views

(z) Gossypiutn herbaceum, Linn.

(Watt & Murray.) 🔪 The Asiatic series of Cottons. regarding G. Wightianum be confirmed by more extended study of the CLASSIFICA-TION, Indian cottons, that plant is probably the original condition from which all the better cottons of India have been derived. Under G. Wightianum mention will be found of a wild form of cotton, found in Rajputana and the Panjab, which appears to be that species, a fact which powerfully supports Todaro's position. DIAGNOSTIC CHARACTERS.—Perennial and bushy in the warmer areas, annual where killed by winter. *Stems* erect, sparsely hairy, branches spreading, the bush sub-pyramidal. *Leaves* pale green, thick, leathery, and larger and broader than in G. Wightianum, half segmented into 3-5, often 7 lobes: lobes ovate-rotund, con-stricted below, the middle one acuminate, all shortly bristle-tipped; upper surface reticulate, pubescent, with longer hairs on the veins and felted below when young with hifd or triffd (not stellate) hairs merging ciliate. *Stimulas* linear longelate with bifid or trifid (not stellate) hairs, margins ciliate. Stipules linear lanceolate, those nearer the peduncles shorter and broader. *Flowers* longer than the bracteoles, petals obovate, unequally cuneate, yellow, with a large purple patch, slightly united together below; *peduncles* about half the length of the petioles; *bracteoles* ovate sub-obtuse, cordate, inciso-dentate, the entire portion sub-rotund, united to each other below, in texture thinner and more numerously veined than in Indian cottons. Capsule ovate-rotund 4-5-celled, cells 6-7 seeded, seeds ovate, beaked at the hilum; undervelvet or fuzz as it is often called short, firmly adhering, whitish-grey; wool fairly long and white. The chief features of this plant, which distinguish it from the ordinary Indian cottons, are its broader leaves, more rounded lobes, the absence of stellate felted hairs, and the shape of the bracteoles, which approach much nearer to those of the American than to any of the Indian cottons. The remark that the seeds are beaked is of considerable interest, since, if specific, this would indicate the inferior quality of cotton, with a spine on the end of the seed, alluded to by Mr. Hare (see remarks below in connection with Berar), as one of the forms of G. herbaceum, Linn. We have seen only one or two examples of what we regard as true G. herbaceum in Indian collections. Of these may be specially mentioned the Gilgit specimens issued as No. 250 from Kew, and a specimen collected by the Editor in a garden on the Nilghiri Hills. But the following are forms which we recognise as possibly only varieties of G. herbaceum, and the forms of the species which alone exist in

This is described as possessing much smaller fruits than the type, and of an ovate, sub-rotund shape, with the apex deeply depressed.

According to Todaro this corresponds to much of the *Dhollera* cotton, a form which is grown in Kathiawar, Cutch, Kaira, and Cambay, &c.

Var. obtusifolium.

Todaro regards this as a species, but we can see very little to separate it. Indeed, like *var.* microcarpum, it is a form that connects in some respects G. Wightianum with G. herbaceum. The description originally given by Roxburgh appears to have been simply reproduced by Todaro, also by Masters in the *Flora of British India*. It is not appalent whether or not these authors have specially studied the plant.

DIAGNOSTIC CHARACTERS OF OBTUSIFOLIUM.—Shrubby, much branched. Leaves small, 3, rarely 5, lobed, lobes ovate, obtuse, entire; stipules falcate; bracteoles ovate, obtuse entire or nearly so. Capsule ovate, 3-celled, with 3 seeds in each cell; seeds free, coated with closely adhering green velvet below the ashy-white wool. T od a r o remarks that it differs from all the other species in the entire bracteoles and in having only three seeds in each cell.

Roxburgh supposed this to be a native of Ceylon, but Thwaites and other more recent writers have failed to confirm this statement. The plant, as recognised above, has, however, been collected by Griffith in Ava, and the Editor came across it in a semi-wild condition on the Naga 26

Conf. with P« 57-

27

Conf. with p. 102.

GOSSYPIUN	I The Asiatic series of Cdttons.
herbaceuir	
CLASSIFICA- TION.	Hills and in Manipur, found on deserted lands near ruined .villages. Samples have also been obtained from Madras of a plant with small and mostly three-lobed leaves, which appears to be the obtuse-leaved cotton of most writers, and we have grounds for believing that the plant we allude to, at least, is fairly extensively cultivated throughout India, especially in the warmer areas and on poorer soils. Indeed, it seems probable that it is the inferior cotton with beaked seeds referred to above.
28 Conf. with pp. 64, 85, 88, 98, 102, 111 ,	(2) Gossypium Wightianum, <i>Tod., Cult del Cot, 141,</i> This, according to Todaro, is the chief cultivated cotton plant of India, being mainly met with, in its purer forms, on the Western side of the Pen- insula. It is apparently the G. indicum of lire's <i>Cotton Manufacture,</i> <i>p. 126.</i>
118, 129, 152, 142, 147, 150.	DIAGNOSTIC CHARACTERS.—Stems erect, somewhat hairy, branches spreading and ascending. Leaves when young densely matted, with short, thick, stellate lours, which fall off in patches leaving a few scattered all over both surfaces; ovate-rotund, almost obsoletely cordate, 3-5, rareiy 7, lobed, lobes ovate, oblong, acute, constrict- ed at the base into the rounded sinus which in the young leaves rises up as a fold: stipules on the peduncles almost ovate, the others linear-lanceolate acuminate. Flow- ers yellow with a deep-purple patch at the base, becoming reddish on the outside on passing maturity; bracteoles small, slightly united at the base, ovate cordate, acute, shortly toothed : peduncles erect in flower, recurved in fruit, one-fourth the length of the petioles. Capsule small, ovate acute, 4-celled, with 8 seeds in each cell; seeds small, ovate, sub-rotund, velvet very short and firmly adhering, wool white or whitish-red. Syn. —Todaro cites the following references to this form :—G. HERBA- CEUM, WW. OBTUSIFOLUJM, Wight, Ic, t. 0/ G. ALBUM, W. & A.; G. HERBACEUM , Mast, in Hook., PI. Br. Ind., ex parte.
	The peculiarities of the leaves, bracteoles, and capsules of this species
	are contrasted with those of G. herbaceum, <i>Linn</i> , in Todaro's plate IV,
	The leaves of the latter are larger, broader, more rotund and much more
	deeply cordate, with the lobes more rounded, and acute-apiculate, instead
	of ovate, oblong, acute as in G. Wightianum. The bracteole is also broader, much thinner in texture, more deeply cordate and often gashed*
	somewhat resembling the bracteoles of the G. barbadense series. We
	have very carefully examined a large assortment of specimens of G
	Wightianum and have come to put a considerable degree of faith in the
	value of the character of the hairs in isolating that plant not only from G herbaceum, but also from G. neglectum. The latter has long spreading
	hairs and is only stellately tomentose when hybridised with G. Wightianun
	just as that species shows a strain of G. neglectum by the presence on th
	veins, of a few of the long hairs.
	We have had the pleasure of examining in Mr. J. F. Duthie's collect tions of Gossypium, now deposited in the Saharunpur herbarium, on or two specimens bearing on their labels the remarks «'the wild cotton o
,	Merwara," " apparently quite wild in the forests west of Bdr in Merwara. Mr. A. E. Lowrie has also contributed a sample of the same plant found in fruit in Ajmir on the 30th October 1883. Mr. Lowrie remarks of this " the wild cotton I send you was found as a creeper over other trees.
	These samples were kindly examined (in consultation) by Mr. Drummond Deputy Commissioner, Karnal, who thought he could identify therm a the wild cotton alluded to by him in his remarks below, in connection wit
Conf. with	the Province of the Panjáb. Mr. Drummond's description of the Karna • wild plant' would lead to the supposition of its being G. neglectum, bu we have seen no specimen of the plant referred to. We have already inc
p. 119.	dentally alluded to these samples, and need only add that they appear to be the wild, or at least semi-wild, condition of G. Wightianum.
29	HYBRIDS OF THE HERBACEUM SERIES.
	There are numerous hybrids from G. Wightianum, but all w
	G. 29

. The Indian herbaceum Cottons. (Watt & Murray.) h	DSSYPIU Prbaceuu
have examined are hybrids with G. neglectum, more rarely with G. arboreum. These hybrids have more deeply segmented leaves than G. Wightianum, and possess the extra tooth in the sinus which we regard as characteristic of the G. arboreum series. They are either very hairy, if hybridised with G. neglectum (having both kinds of hairs) or almost sub-glabrous, if with G. arboreum. Of this latter class may be mentioned the common'Himalayan crop of which Dr. J. E. T. Aitchison's No. 462 from Kuram Valley may be mentioned as a good type. We in fact regard Todaro as having isolated as species some of these hybrids, for example, the following, taken up in alphabetical order:—	CLASSIFIC TION.
 G. cernum, Tod., Cult dei Cot., 160. This is said to be cultivated in India, its chief characteristic feature being the reflexed upper portion of the bracts. The description of the leaf as given by Todaro mould point to its being a hybrid from G. neglectum with pale sulphur-coloured flowers with a purple spot. The capsule is said to be fairly large, cylindric, acute, 4- rarely 3- celled, cells 7-11 seeded, wool short, white or reddish. 	30
 2) G. indicum, Latnk.; Tod., Cult, dei Cot., 150. This, according to Todaro, is the Cap as of Rumphius (Ami. IV., 33, t. 12). The Linnean species, G. herbaceum, is, he thinks, a combination of the characters of G. Wightianum with the plant he isolates as G. herbaceum, Linn., proper, and G. indicum, Lamk. The present restricted species is characterised by having 3-lobed leaves which are eglandular and shortly pointed, and small bracteoles, sub-entire or slightly toothed on the apex. But that description recalls G. obtusifolium, of which it may be but a form with more pointed leaves^ 	31
 3) G. intermedium, Tod., Cult, dei Cot., 153. * This, Todaro, on the authority of Royle (Cotton in India, 142), says, is cultivated in India, chiefly in the Deccan, and is distinguished by the free re-curved segments of the style. It would, however, appear to be one of the hybrids between G. Wightianum and G. neglectum, in which the segments of the leaves are usually broad as well as the stipules. The flower is large and opens wide in flowering. Capsule ovate acute, rough on the surface, 3-celled, each cell 8-seeded : wool reddish white. 	32
4) G. nanking, Meyen: Tod, Cult, dei Cot., 147. This, Todaro says, is the true Nank'n cotton—a Chinese plant often grown in India under the name of G. religiosum; the Nankin or reddish cotton of India being, he affirms, perfectly distinct and a form of G. hirsutum. The description given by Todaro, however, as also his figure III., suggests its being possibly a hybrid between G. Wightianum, Tod., and G. herbaceum, Linn. The lower leaves are sub-rotund, obsoletely cordate, 5-7 lobed, the lobes oblong obtuse, with the base only slightly constricted; upper leaves 3-5 lobed, lobes ovate obtuse. Flowers pale yellow with a purple spot; bracteoles exceptionally small, ovate sub-rotund; peduncles recurved in fruit, much shorter than the petioles. Capsules ovate acute (in the figure shown as sub-rotund); 3-celled, cells mostly 5-seeded, wool reddish yel- low.	33 Conf. with P. 17.
 5) G. roseum, Tod., Cult, dei Cot., 164. 5) G. roseum, Tod., Cult, dei Cot., 164. This is also said to be cultivated in India and is described as being erect with slender spreading branches. In the description of the leaf it approaches most to G. neglectum. Flowers white or pale yellow with a purple tinge on the outside, petals remaining convolutely tubular, thus never completely expanding-, also united together below : bracteoles rotund-ovate, dentate more or less united below. Calyx constricted at the base. Capsule very small, ovate acuminate, red-coloured, 3-celled, cells 5-6 seeded ; velvet ashy-coloured as also the wool. This would appear to answer to the description of some of the Cottons of Eastern Bengal and Assam. 	34 Conf. witt pp. 10-11
VARIABILITY OF THE CAPSULE AND SEED IN GOSSYPIUM. It will be seen from the above notes on some of Todaro's species that they would appear to possess few, if any, characters that could be accepted as absolutely separating them. They differ mainly in the shape of the cap-	35

G. 35

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GOSSYPIUM herbaceum.	Variability of	of the Capsule	ând Seed.	•	<u></u>		
CLASSIFICA- >ION.	sole, the number of cells and flower. Seeing that Gossypius to be wondered at that every be met with. Seme years ago by Dr. Forbes Watson) in the celled growths of the so-calle Reports of the Government E dency, numerous returns are p break down completely all bot Thus in Hyderabad (Sind) va American and Sindi cottons a most pronounced tendency t sules, regardless of whether 3-4-5-celled pods.	m is solely cult possible form a considerable in e nature of the d G. herbaceur experimental Fa published on this anical argument prious experiment the results prion to produce 4-cell	ivated for nd condit terest was plants obt n of India rms, in the subject, w ts based or its were per oving tha ed and the	its wool, ion of frui awakened tained fro a. In the he Bomba which woul a these cherformed, t the form e latter 3-co	it is not it should d (mainly m 3-4-5- e Annual ay Presi- d seem to naracters. both with ner show eUed cap-		
	-	MERICAN SEED.			•		
			PERCENTAGE OF PODS OF EACH KIND OBTAINED.				
	Kinds used as Seed.	Total number of Pods collected.	3-celled.	'' 4-celled.	5-celled.		
	3-celled	4,633 6,354 m 4>><26 5,814	6*6 2-7 2*0	78-4 80-3 69-0 767	14-9 17*0 29*0 18*2		
		SINDI SEED.					
	Vinde word on Sand	Total number of Pods collected.	PERCENTAGE OF PODS OF EACH KIND OBTAINED.				
	Kinds used as Seed.		3-celled.	4-celled.	5-celled.		
	3-celled. 4-celled. 5-celled. Not selected	17.893 23,146 3,280 21,251	66*8 66-2 34'1 57*2	33'1 33'6 63'5 42*3	0'1 0*2 2*4 0'5		
	Similar results were obtained by experiments continued in the follow- ing year {Annual Report, 1887-88, pp. 5-7), and commenting on the experi- ments with the American seed it is stated, *• The greatest percentage of pods are in every case pods with 4-cells, the normal number in this class of cottons. The seed from 5-celled pods has, however, produced the greatest percentage of similar celled capsules," The remark regarding the Sindf cottons may also be reproduced :—" In this, as in the American, the percentage of capsules having the larger number of cells is lower than last year, but the tendency seems to be in the same direction,—that is to say, the seeds from pods with the greatest number of cells give the highest proportion of similar celled pods." We are not told the particular growths of either American or Sindf cottons selected for these experiments, but thS inference seems justifiable that all the former shewed a strong tendency to become 4-celled, while the latter became 3-celled. From these facts we may at least assume that these are the chief specific peculiarities of the fruit in the two great series of Gossypium, and learn the futility of mak- ing species out of races or hybrids of Indian Cotton according to the size, shape or divisions of the capsule,						

G. 35

Dye from Gossypium. (Watt & Murray)	DSSYPIUM rbaceum•
DYE FROM GOSSYPIUM AND THE DYEING OF COTTON GOODS. The colouring matter seen in the wild cottons, and also in Nankfn cotton, has been found, by Schunck (Memoirs of the Literary and Philo- sophical Society of Manchester), to be present, to a limited extent, in all forms of cotton. Schunek's paper (l.c.)' On some Constituents of the Cotton Fibre,' investigated the substances contained in or attached to the frame- work of cellulose which constitutes the staple. He found that these sub- stances were almost insoluble in water but soluble in hot alkaline lye. The action of concentrated aqueous solutions of caustic soda and potash had, however, been some time before observed by M. Alkan and turned to practical use by Mr. John Mercer, who patented a process now known as mercerising, by which the fibre was prepared for certain dye re-actions. Mercerising may be expressed as an extreme and powerful process of hydrolysis or bleaching, accompanied with structural changes in the fibre. Not only is cellulose separated from non-cellulose, but the shape or con- tour of the ultimate fibre-cells is altered. Schunck, however, confined himself to the examination of the substances separated in solution by alkaline lye, and which are afterwards precipitated by acids. The acid he employed was an excess of sulphuric, and the copious brown flocculent pre- cipitate when thrown down from the alkaline solution was found to be	DYE. 36
cipitate when thrown down from the alkaline solution was found to be o*337 P ^{er} cent, of the weight of 'Dhollera' yarn employed. Similar yarn of Middling Orleans yielded 0*48 per cent, of precipitate. On examining the material thus obtained, he found it to contain (1) Cotton wax : (2) Margaric acid ; (3) A colouring matter easily soluble in alcohol: (4) A colouring matter sparingly soluble in alcohol: (5) Pectic acid : and (6) Albuminous matter. Of these substances the pectic acid far exceeds the others in quantity, then follow the colouring matters. But it is well known that, on bleaching cotton, it sustains a loss of 5 per cent, of its weight, whereas the total weight of the substances removed by Schunck and afterwards precipita- ted by acid, amounted to only about £ per cent. It is, therefore, assumed that the difference in loss on bleaching, was either removed by the water or not precipitated from the alkaline solution by the acids used by Schunck. It is known, for example, that certain derivatives of pectine are not precipitat- ed by acids. Hence it is not improbable, as contended by writers on this subject, that the substance that escaped observation in Schunek's experi- ments was para pectic acid originally removed is assumed to be possi- bly converted, through the action of the alkali, into metapectic acid—a substance very soluble in water, and not precipitable by acids. These discoveries in the nature of the substances removed from cotton by bleaching and mercerising, have a direct bearing on many of the textile and dyeing industries. They are interesting also from a purely botanical consideration, since we learn that the colouring matter, in cotton, is a nor- mal constituent, which yields to bleaching. The interest in Nankfn or <i>khaki</i> cottons, as supplying a nature-dyed textile of a desired colour, was, therefore, in the light thrown on the subject through Schu nek's discov- eries, very probably mis-directed, since the colour must of necessity be femovable by the ordinary methods of washing with soa	Conf. with p. 79.

species of Gossypium. Recently, through the kindness of Mr. Beheram Shah, Forest Officer, Palanpur State, Bombay, we have had the pleasure of receiving a piece of cotton cloth said to have been dyed with a decoction of the ROOTS of G. herbaceum mordanted with alum. A soft delicate colour has been thereby produced which, if permanent, might be turned to

Roots. 37 i

G. 37

GOSSYPIUM	The Fibre from Gossypium.
herbaceum.	
DYE.	much account. It is remarkable that no other Indian writer appears to
Flowers.	have observed the Natives of this country using the root; few even mention the FLOWERS as being so used, which, like those of Thespesia populnea,
	afford a yellow dye. Mr. Liotard, in his memorandum on the Dyes of
38	India, incidentally mentions the flowers as being employed for dyeing pur-
	poses in the Mainpuri district.
	Mr. T. Wardle, in his report on the "Dyes of India," states that the
Í	Collectors of Jacobabad and of Hyderabad (Sind) had furnished him with samples of the flowers. Mr. Wardle obtained from these, according
	to the mordants used, various shades, which ranged from bright yellow,
	greenish yellow, and fawn colour, to orange, reddish, and brownish yellow.
	Commenting on this subject Mr. Wardle wrote, "Cotton flowers are very
	rich in yellow colouring matter. They will give bright yellow colours, and, as a dye-stuff, have much the same properties as Butea flowers."
	It may be here added that the above facts of a knowledge of the dye-
	property of cotton roots and flowers, being practically confined to Sind
	and Palanpur, might be accepted as denoting a more ancient acquaintance
	with the plant. If this inference be justifiable, it might perhaps be viewed as confirming the accuracy of the reports regarding a wild Gossypium in
	Sind, in certain parts of the Panjab, Rajputana, and the hotter localities
	of the North-West Provinces.
Blue Dye.	In Gmelin's <i>Handbook</i> the subject of a BLUE DYE obtained from cotton SEED is discussed. Dr. Warden, in a note on this subject, says,
c ³ Q	"Cotton seeds contain a principle which, by the action of acids, yields a
Seeds, 40	blue colouring matter—cotton seed blue. This blue is not altered by reduc-
40	ing agents, but is at once decomposed by oxidising ones. It is insoluble
	in water. An alcoholic solution gives a fine blue colour to fabrics either mordanted or unmordanted with alum; the colour, however, fades rapidly."
	The subject of DYEING and CALICO-PRINTING is too extensive to be
	dealt with collectively in this article. The reader is, therefore, referred to
1	technical works such as Buck's Dyes of the North-West Provinces: McCann's Dyes and Tans of Bengal : Liotard's Memorandum on the Dyes
	of India : Crooke's Handbook of Dyeing: Hummel, The Dyeing of Textile
l l	<i>Fabrics</i> , &c. Also to the separate articles in this work on the more impor-
\	tant dye materials such as INDIGO, SAFFLOWER, LAC, MADDER, MORINDA,
	&c, &c. FIBRE.
FIBRE.	This will be treated of in detail under the section of this article
41	designated COTTON. It may be as well, however, to give here a brief
	account of the microscopical and chemical features of the floss. The
	cotton staple consists of elongated simple cells, developed around the seed, and is not therefore a bundle of cells or vessels as in the case of Flax, Jute,
	and other commercial fibres. Under the microscope cotton is seen to be
	an elongated cell or fibre, ribbon-shaped, with corded edges, thickest at
	the base (the end of attachment to the seed), and continued upwards without
-	material change for three-fourths of its length, after which it tapers to a point. Each fibre is twisted many times on itself and on transverse section it
	is seen to be a collapsed cylinder, the walls, compared with the calibre, Veng
	of a considerable thickness. This is the appearance of the perfect fibre,
	but there are often found many imperfectly developed or immature oftes,
	which, though twisted like the perfect ones, are thin and brittle, and owing to the deficiency of cellulose do not manifest the double outline of margin.
	The peculiar twistings give strength to the fibre and facilitate the process
	of spinning, the natural twistings becoming interlocked. These twistings
ł	do not exist on the fibre before the dehiscence of the pod. On ripening
'	nourishment from the seed is gradually discontinued, a vacuum is thus
	G. 41

· The Cotton-Seed, Oil, and Cake. (Watt & Murray.) Go	SSYPIUM erbaceum.
left in the interior, first, at the apex, afterwards along the length to the base. The atmospheric pressure occurring on these hollow tubes causes them to twist and collapse. The mean length of the cells (popularly the staple) in Sea Island cotton is 1.65 inch ; in Egyptian 1.50 inch ; in Pernambuco 1.25 inch : in American 1.10 inch ; in Indian 0.90 to 0.65 inches. Cotton floss consists of nearly pure cellulose, together with only i to i J per cent, of inorganic matter. The specific gravity of New Orleans is said to be $1*165$, $a^{\circ}d$ Bourbon I'lio. Cotton is tasteless, devoid of smell, insoluble in water, alcohol, ether, fixed and volatile oils, or vegetable acids. It is soluble in strong alkaline solutions and decomposed by concentrated mineral acids. The action of nitric acid, &c, is referred to in the section under Medicine in the formation of Gun-cotton and Collodion. The colouring matter present in the fibre has already been dealt with and need not be again discussed in this place (Con/, with Dye, p. 32). Cotton exhibits a strong affinity for alumina, hence the use of alum as a mordant in dyeing. Iron stains it a yellow colour which, unless recent, cannot be removed by alkalis or soap. Oxide of tin, which has an affinity for the staple, is frequently used as a mordant in dyeing the fibre. Nitric acid and heat decompose it. It is extremely combustible, burning with a clear bright flame.	FIBRE.
The STEM yields a good FIBRE, which may be separated by retting. Several writers have alluded to this subject and recommended its utilisa- tion, but apparently the people of India are not aware of this fact, since no mention is made of their putting it to any useful purpose. Most malvaceous plants are rich it) fibre, and doubtless the cotton stems are not in this re- spect different from those of Hibiscus, Urena, Pavonia, <i>tsfc</i> . It is probable that in the cultivation for the floss a branched stem is produced which might not be conveniently treated for its fibre. If it could be, the supply would naturally be very great and afford a new source of income to the	Stem. 42 Fibre. 43
people. COTTON-SEED, OIL, AND CAKE.	44
References.—Hawke, Report on Oils of S. India, 39; Cooke, Oils and Oil-seeds of India, 4\$; Useful PI. Bomb., 21\$; Simmonds, Tropical Agriculture, 404-405; Jour. Soc. Arts, 27th July 1883; Indian Agricul- turist, Oct. 12th, & Nov. 2nd, 1889; Edinb. Quart. Jour. Agri., 1854; Spons, Encyclopaedia; Balfour, Cyclopaedia, &c, &c.	
After the floss has been removed, by the process technically known as ginning, the SEEDS are utilised either as cattle-food or as a source of oil. Prior to the American war the seeds were viewed as useless, the difficulty of preparing them as a manure being such as to prevent, to a large extent, their utilisation even as a fertilizer. A writer, in the Report for 1874. issued by the Commissioner of Agriculture, Washington, says: "The seed jn its natural state, or when converted into meal, has greater manurial value than any other single substance." He supports this statement by giving an analysis of the ash of cotton-seed as follows:—	SEEDS. 45
PotishPer cent.SodaMtgnesiaLimeYhosphoric acid<	
In spite of being so valuable a substance immense quantities were in America annually destroyed as useless; to some extent this is the	
3 G. 45	

The Cotto&-Seed _y Oil, and Cake. $rw \gg A, M$. G (Watt & Murray.) _{h e}	OSSYPIUM r b a c e Q m #
"The prejudice against the use of the oil for domestic purposes is fast disappearing, and refiners now sell if largely for cooking purposes. In the New England States, the cotton-seed meal is used as cattle-food, the the south it is in most instances applied direct to the ground, or in the south it is in most instances applied direct to the ground, or in soft instances applied direct to the ground, or in the south it is in most instances applied direct to the ground, or in the south it is in sot instances applied direct to the ground, or in the south it is in sot instances applied direct to the ground, or in the south it is in sot instances applied direct to the ground, or in the south it is in sot instances applied direct to the ground, or in the south the value of cotton-seed cake as an article of diet for cattle, especially milch-cows. Cattle do not, it is stated, seem to take to it is obtained for many generations this appears to have been the chief, if not the only, use of the immense quantity of seed annually produced. Mr, H. J. 6. Cotton, however, in a report published in 1876 on the Cotton Cultivation and Trade of the interior of Bengal, wrote: —'' There is no trade in preserving only sufficient seed of his own plant for future sowing.'' It is showed or fully understood here and there all over Asia. In the report of the orlan the assome fibre adhering to it, and has a tendency to accumulate in masses. These are thrown into a machine containing a screw-knife revolving in a trough, which divides the materials into particles fit for the screening operation. This is conducted, first, in a sleve with meshes that show the sand and dirt to pass, while retaining the seed, and then in one through which the seed as the very the safew at the meshes that in the scele is next passed through a special gin for removing in a trough, which divides the materials into particles fit for the screening operation. This is conducted, first, in a sleve with meshes that show the sand and dirt to pass, while retaining the seed, a	Oil Expres- sion. 49

GOSSYPIUM The Cotton-Seed, Oil, afd Cake. herbaceum. is required for sowing. One authority estimates that ioofb of seed give 2 gallons of oil, 48ft of oil-cake, and 6lb refuse fit for soap-making; another says that one ton of American seed gives 20 gallons of oil; another says that one of oil off off off off off off off off off of		
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		as an oil-yielder. Indeed, in this case, as in many other features of cotton cultivation and utilisation, the natives of India do not manifest that in- timate knowledge which characterises their acquaintance with most of the products of their country. While they grow many plants purely as sources of oil, for food, and lighting purposes, they seem to be practically ignorant of the fact that cotton-seed affords one of the most wholesome of oils. In <i>Balfours' Cyclopaedia of India</i> it is stated that "when obtained by pressu'le its colour, owing to the presence of a resinous substance, is of a very dark red, and io to 15 per cent, is lost in bleaching it. When prepared by steaming the seeds, and collecting the oil by skimming it from the surface of the water, it has a bland, light-coloured appearance. (<i>Faulk- ner.</i>)" In <i>Cooke's Oils and Oil-seeds in India</i> it is stated that cotton-seed is "in some localities considered a better food for the working bullock than grain. It produces, under the action of the native oil mill, 25 per cent, of a good oil, which, by being purified, might grow into an extensive article of commerce. Mr, Bingham does not think it would answer to export* the seed, as, owing to the fibre adhering to it, and perhaps other causes, it is very liable to heat and deteriorate in bulk. The oil is said to be a very useful one, more so than most others for machinery purposes." (<i>Agri Hort. Soc. Ind. Jour.</i> > XII., 343). The above passage is practically a re- print of Mr. Bingham's remarks, in his account of the oil-seeds of the Sasse- ram district (published in 1862), and it has been repeated in most works on this subject without being in any way amplified or confirmed. The singular silence, on the uses of cotton-seed, in the Gazetteers is practically a proof of the total negleet that prevails throughout India. The <i>kapas</i> or cotton with its seed is sold to the dealers. Who clean it and dispose of the seed as they please, returning a certain amount to the cultivators to be sown in the succeeding sea

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	DSSYFIUM
The Cotton-Seed Oil and Cake (Watt & Murray)	rhaceum.
It is admitted by many American writers that the income derived from the seed has made all the difference between profitable and unprofitable cotton cultivation. If the dealers in the future are to continue to pay the cultivators the same average amount for cotton with its seed, as they did in the past (when the seed was worthless), an undue profit will fall into the hands that least deserve it. In this respect it would seem clearly the duty of those in authority to keep before the eyes of the cultivators the progress made in the cotton-seed traffic. The best incentive to cleaning their own cotton, preserving their own seed, and improving the cultivation generally, would doubtless be secured through personal gain. Some idea of the magnitude of this possible future trade may be learned from the fact that since India produced last year a little over 9 million cwt. of cleaned cotton, that amount must have been obtained from 27 million cwt. of seed. Allowing half to be required for home consumption Snd seed for next crop, over 600,000 tons should have teen available for export, or twice the quantity imported by the United Kingdom from all sources. SPECIAL OPINIONS.—§ "The seeds are given to cattle to increase and improve their supply of milk. The seeds furnish an oil which is used for lighting purposes." <i>[Narain Misser, Kathe Bazar Dispensary, Hoshang- abady Central Provinces</i>). "The seeds are largely used in various parts of India in feeding cows, to increase the quantity and improve the quality	SEED & OIL.
of their milk." (Assistant Surgeon Nunda Lai Ghose, Bankipur).	
PART of this plant contains much mucilage, and has been used as a demulcent. The seeds yield by expression a FIXED OIL of the drying kind, which is employed for making soap and other purposes. The BARK of the root has been supposed to possess medicinal virtues, and is now re- cognised in the U. S. Pharmacopoeia." "Cotton SEEDS have been employed in the Southern States with great asserted success in the treatment 0\$ in- termittents." "A pint of the seeds is boiled in a quart of water to a pint, and a tea-cupful of the, decoction is given to the patient in bed, an hour or two before the expected return of the chill." Ainslie says that the seeds of G. barbadense, in the form of an emulsion, are given in dysentery and are supposed to be pectoral. They yield by expression an oil which is much used, and is considered to have, in a peculiar manner, the virtues, when externally applied, of clearing the skin of spots and freckles. A tea made of the young LEAVES is recommended in lax habits, and for preparing a vapour bath for the anus, in cases of tenesmus. Of the root of G. herba- ceum, Ainslie remarks that he suspects it possesses little real virtue. The Tamil doctors are, however, he adds, in the habit of prescribing a decoc- tion of it in strangury and gravel. Dr. Dymock (<i>Pharm. Ind., /., 22\$</i>) says : "Eastern physicians consider all parts of the cotton plant to be hot and moist; a syrup of the FLOWERS is prescribed in hypochondriasis on ac- count of its stimulating and exhilarant effect; a poultice of them is applied to burns and scalds. Cotton CLOTH or mixed fabrics of cotton with wool	MEDICINE. Herbaceous part. 51 Fixed Oil. 52 Bark. JS- 54 Leaves. 55 Flowers. 55 Flowers. 57 urnt Cotton. 58

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OSSYPIUM nerbaceum.	Properties of Gossypium.
MEDICINE.	mended in uterine colic." In the <i>Gazetteer of Bulandshahr</i> cotton-seeds, <i>binaula</i> , are included in a list of the more commonly employed indigenous drugs: the properties assigned to these seeds are not however stated. Atten-
Root-bark, 59	tion appears to have been first drawn to the emmenagogue property of the cotton ROOT-BARK through the observation made by Dr. Bouchelle, of Mississippi, that it was used by Negro females to produce abortion. On this subject Dr. Dymock writes,—"There appears to belittle doubt that it acts like ergot upon the uterus, and is useful in dysmenorrhoea and suppression of the menses when produced by cold, a decoction of four ounces of the bark in two pints of water boiled down to one pint, may be used in doses of two ounces every 20 to 30 minutes, or the fluid extract may be prescribed in doses of from 30 to 60 minims," The above passage is almost word for word as originally published by the discoverer, so that the knowledge of this property is apparently confined to America. This fact may have a historic significance, for, although the people of India seem to have H ad a peculiar aptitude in discovering emmenagogues and aphrodisiacs, they failed to discover any such properties in this case, and the cultivation of cotton might therefore be inferred to be less ancient than is generally supposed.
Preparation of Cotton. 60	A special preparation of COTTON is made, which removes its greasiness and renders it absorbent. This absorbent cotton may be further medicated with carbolic acid, salicylic acid, or boracic acid, and in this form used as an application or dressing to wounds. Its effects are chiefly due to the absorption of effused fluids and the protection it affords from the air. It is similarly used to arrest haemorrhage, its action being mechanical, but for ³ this purpose the special preparation known as 'STYPTIC COTTON' is gene-
Styptic. 61 Gun-cotton. 62	rally employed. GUN-COTTON or PYROXYLIN is prepared by dipping the floss in a mixture of equal parts of nitric and sulphuric acids, and by after- wards washing freely with water and drying. This explosive substance is readily soluble in a mixture of ether and rectified spirit, forming the officinal COLLOOIUM or COLLODION.
CHEMISTRY. 63	^{rt} CHEMISTRY OF GOSSYPIUM BARK.—In the United States Dispensatory, tatcen for the most part from the American Journal of Pharmacy, will be found the chief facts regarding the chemistry of this substance. These opinions are briefly reviewed in the <i>Pharmacographia Indica</i> as follows:—" The bark contains <i>starch</i> , and when fresh, according to W. A. Taylor (1876), a <i>chromogen</i> , which dissolves in alcohol with a fresh yellow, gradually chang- ing to a bright brownish red. The same change takes place on keeping the bark for some time, when it yields a red tincture with alcohol. This substance was examined by Professor Wayne (1872) and W. C. Staehle (1878), who regard it as of a resinous nature. The latter obtained about 8 per cent, of this substance, which is soluble in 14 parts of alcohol, 15 of chloroform, 23 of ether, and 122 of benzol; also in alkalis, from which solution it is again precipitated by acids. The potassa solution diluted with water is of a sage green tint. Glucose was likewise observed, and the aqueous solution of the alcoholic extract contained a principle which gave a purplish-black precipitate with ferric chloride. C. C. D rued ing (1877) obtained also a yellow resin soluble in petroleum benzine, a fixed oil, a little tannin, and 6 per cent, of ash." <i>c</i> SPECIAL OPINIONS—§ " Cotton-wool is a filterer of atmospheric germs preventing their access to wounds, cavities of the nose, ear, &c, and for this purpose is very useful after operations, including those on the eye.' <i>{Brigade Surgeon G. A. Watson, Allahabad</i> . "The seeds largely increase the flow of milk, especially in cows, for whom <i>bandla</i> (sic ? <i>banaulf~En</i> .) is one of the best articles of diet. When given to wome the <i>bandla</i> is beater up in a mortar with a little water; the mass is then strained and the juicc mixed with rice and cooked into <i>khir," {Surgeon-Major</i> C. <i>W. Calthrop</i>

Properties of Gossypium. {Watt & Murray).	GOSSYPIUM Hybrids.
Morar). "The seeds are considered to be a nervine tonic and are given for headaches and brain affections." (Surgeon-Major Robb, Civil Sur- geon, Ahmedabad). "Best application in burns and blisters." (Assistant Surgeon Shib Chunder Bhuttacharji, Chanda, Central Provinces). "The seeds, deprived of their outer coat, powdered and given in milk (in doses of 2 drachms) are used as a tonic. *' (ist Class Hospital Assistant Lai Mahomed, Main Dispensary, Hoshangabad, Central Provinces.) "The young fruit is given to check dysentery." (V. Ummegudien, Mettapollian, Madras.) "The oil from the seeds is used as a liniment in rheumatic affections." (Honorary Surgeon P. Kinsley, Chicacole, Ganjam, Madras.)	
DOMESTIC AND SACRED.	
The sacred uses of cotton have already been alluded to. Except among one or two aboriginal tribes the plant as such cannot be said to be sacred, £ut the thread prepared from the so-called <i>Nurma</i> cottons is that alone prescribed to be worn as the Brahminical string. The STEMS of the cotton bush are largely used for agricultural purposes, being made into baskets in Bombay and other parts of India. Throughout the Panjab they are used in making the wattle sides of carts, being supposed better suited to such purposes than for basket-work. One of the most universal usages of the dry cotton stems is as fuel: this may be seen in all the cotton districts. In <i>U. C. Dutt's Materia Medica of the Hindus</i> (under the Diamond) occurs the following curious passage :—'' Diamond is purified for medi- cal purposes by being enclosed within a lemon and boiled in the juice of the leaves of Sesbania grandiflora (<i>vaka</i>). It is reduced to a powder in tfie following manner: A piece of the root of a Cotton plant is beaten to a paste with the juice of some betel leaves. Both these vege- tables should not be less than three years old. Diamond is enclosed	
within this paste and roasted in a pit of fire. The process is repeated seven times, when the stone is easily reduced to a fine powder. "	}
IV. G. StOCksii, Mast. ; Fl. Br. Ind., /., 346. References.—Tod., Cult, dei Cot., 132; Dymock, Warden, and Hooper, Pkarm. Ind., 224-228; Murray, PL and Drugs, Sind, 64. DIAGNOSTIC CHARACTERS.—Leaves glabrous, palmately 3-5-lobed, segments roundish or oblong obtuse. Bracteoles ^A deeply laciniate, segments linear lanceolate. Flowers small, yellow. Capsule ovoid. Seeds devoid of felted down, covered with yellow adherent cotton not easily separable.	66
Habitat.—A shrub found on the lime-stone rocks of the coasts of Sind. Dr. Masters and, following him, Todaro and DeCandolle, regard this as the wild condition of G. herbaceum. It may, however, be pointed out that the glabrous leaves, deeply laciniated bracteoles, and naked seeds ally it more strongly to some of the forms of G. barbadense. The interest in this observation lies in the fact that the most recently dis- covered wild species in Africa is viewed by Masters as very nearly allied to G. barbadense. Doubt may thus be admissible as to the desirability of a hard-and-fast isolation of the forms of Gossypium into Old and New World types, represented by G. herbaceum in the former and G. barbadense in the latter. Stocks himself, while describing his wild plant, in the <i>Gazetteer of</i> <i>ISind</i> , calls it G. obtusifolium, <i>Roxb.;</i> and thus did not view it as distinct.	
V. Hybrids and Hybridisation. If the character of velvety seeds (below the floss) be accepted as an Asiatic peculiarity, the absence of velvet would have to be added to the col- lective characters given above for the indigenous American species of Gossypium. And if this view receive more support than it has hitherto	HYBRIDS. 67

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GOSSYPIUM	
Hybrids,	Hybrids and Hybridisation.
HYBRIDS.	obtained, then the forms of cotton with broad leaves, laciniated bracteoles and velvety seeds (such as G. hirsutum). would have to be regarded as
HYBRIDISA- TION. 68	hybrids. As opposed, however, to this explanation of the velvety-seeded American cottons, there are one or two considerations of importance : Certain writers affirm that it is impossible to hybridise the American naked seeded with the Asiatic velvety forms, or, indeed, the Asiatic with any American. It is further contended that the American velvety seeded cottons were known and even held to be indigenous Western species prior to the recorded introduction of Asiatic cottons in America, which probably took place towards the end of the last century. So again G. hirsutum and other velvety-seeded American forms show little tendency to revert to Asia- tic types, though in India they degenerate to almost valueless states. But, on the other hand, the ease, in certain cases, with which the velvet is in- herited or lost under simple cultivation, would point to its being an acquired and not an originally specific peculiarity, at least in the de- bateable species, the more so since, in the pure types of naked-seeded American or velvety Asiatic, the velvet is neither acquired nor lost. It would thus seem desirable to have the question of hybridisation more carefully investigated. Not having the opportunity of performing such experiments we are compelled to content ourselves with a review of what has been written. That the Indian cottons have been freely hybrid- ised, naturally and artificially, goes without saying. That the same is the case with the American is equally true : the prized New World cottons are in fact mostly sports or hybrids. The debatable point is, can a hybrid be produced, or does such exist, between Indian and American pure cottons? We are bound to admit that there seems, even in the face of all that has been written to the contrary, no good reason for supposing that American and Asiatic species cannot be hybridised. But it may be as well to give here the opinions of writers on the subject. Major Trevor Clarke (<i>Pro- ceedings, Madras Agri-Hort. Soc, June 1871)9</i> in a letter to Mr. H. Rivett-Carnac, for
	the true Indian plant." Mr. W. Walton (<i>in Cotton, its Culture, Trade, and Manufacture,</i> Bombay, 1880) devotes a chapter to the subject of Hybridisation, He seems to have been influenced by so liberal an admiration of Dr. Wight's botanical merits as to accept unreservedly the dictum laid down by that author that hybridisation of <i>any two species of cotton</i> " would be contrary to the laws
	of nature." To do so, wrote Dr. Wight, "it would be necessary to open the flowers before natural blooming, to cut out their stamens before shed- ding their pollen, and then to apply the pollen of the intended male parent to the virgin stigma; if its own pollen had once been applied, the other will not take effect." As opposed to this emphatic statement it need only be said that in India at least the difficulty is to find a cultivated cotton that is not a hybrid. Many authors describe, in great detail, their va- rious methods of hybridisation, so that, in addition to the fact of most of the favourite growths of cotton being botanically hybrids, no such difficul- ty exists as stated by Wight. The failures which Mr. Walton cites, in support of his concurrence with Wight, were failures to naturally fertilise New .Orleans with ^M native Indian cotton." But the difficulty arises, what is native Indian cotton, and even still more so, what is New Orleans ?
	We are, for example, strongly disposed to think the latter a hybrid, as G. 68

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GO	SSYPIUM
· Unbridg and Unbridgetion (Watt & Murray)	<u>Iybrids.</u>
most of the Indian cottons certainly are; hence Dr. Forbes, Mr. A. Elphinston, and other writers on this subject very probably tried to pro- duce a cross between two hybrids—a matter which might have been an- ticipated to prove difficult. We are therefore unable to support Mr. Walton's contention, that these failures in one line of experiment prove the impossibility of any hybridisation. On the contrary, we believe that few genera are more easily hybridised artificially than, or have been so exten- sively hybridised in nature as, the species of Gossypium. This idea is borne out by Todaro's experiments in the hybridisation of cottons. That careful observer not only crossed many species artificially, but he gives it as his experience that it is almost impossible to check the natural hybrid- isation of Asiatic cottons. For example, he observed that G. Wightianum may be crossed with G. neglectum or with G. herbaceum, <i>var.</i> micro- carpum, and that the hybrids take intermediate forms which connect the «ancestral types. By continued cultivation he found that these hybrids were all fertile, but that they gradually approached their specific types if grown near each other, though preserved if they were kept apart. On the other hand, he noted that G. herbaceum, <i>var.</i> microcarpum, fertilised G. Wightianum and G. neglectum, <i>var.</i> microcarpum, on sterile soils, To- daro noted that that form was far more liable to change its characters than was G. Wightianum when similarly treated. He then adds that in these hybrids it is nearly always G. Wightianum that fertilises G. neglectum, the reversion going to G. neglectum, rarely to G. Wightianum. These are facts of great importance, and doubtless there are many others of a similar nafcure which should imperatively be understood, before good results can be obtained in hybridisation. It would appear to be essentially necessary, for example, first of all to thoroughly establish the characters of the species and to possess stock of the purest strain. Haying done so, experiments might	HYBRIDISA- TION.
In the Annual Reports of the Experimental Farms in the Bombay Presi- dency numerous reports occur on the subject of Hybrids and Hybridisa- tion. An interesting paper on this subject will also be found in the Report for 1872 (North-West Provinces and Oudh) from <i>the</i> pen of Mr. J. Simpson, Superintendent of the Cotton Farm at Bulandshahr. In the Journals of the Agri-Horticultural Society of India numerous papers also appear on this subject. Thus, for example, <i>Volume 1. (Old Series), 183-103\$</i> Dr. J. V. Thompson of Sydney describes his process of hybridisation in letail, and gives particulars of his favourite hybrid between Georgian and Maltese brown cottons, to which he gave the name of <i>Georgia tinta</i> . This was probably a cross between G. barbadense and G. herbaceum, or possi- oly G. religiosum, <i>Roxb</i> . In <i>Volume VI. (Old Series), 149-153,</i> Mr. H. Hamilton Bell discusses certain Indian hybrids. In <i>Volume L (New Series),</i> <i>roceedings 1867, x.,</i> Major Trevor Clarke furnishes particulars of his having been working hard at the subject of getting the arboreous sorts of seed and cross. Speaking of the hybrids Tie had produced, he wrote, '' Many were mere scientific experiments, some were the produce of bad orts, some no hybrids at all, and so on.'' In the same volume (<i>Proceed'</i> <i>Ings for i860</i>), Mr. S. H. Robinson furnishes the Agri-Horticultural fociety with cotton grown at Goosree from seed of a hybrid cotton produced	

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HYBRIDISA-TION, by Major Trevor Clarke, a cross between Sea Island and Bourbon [Con/, with the remarks regarding Baxnia Cotton, p. 18 and p. 19.)

It is perhaps needless to quote other passages in support of the contention that hybridisation is possible, or that many hybrids exist. Suffice it to add that we are strongly disposed to regard all American velvety-seeded cottons as hybrids between the American and Asiatic series of forms. When, or how these were produced is quite another matter, but that in India they should show no sign to revert to the G. herbaceum series establishes one peculiarity of their hybridisation, but does not disprove their origin as here suggested. There are many examples of hybrids produced in a particular manner, which invariably, in retrogression, produce one and not the other strain. To arrive at a more precise conception of these supposed American-produced hybrids, it would be necessary to know whether, in the home of their birth, they show a tendency to revert to the G. barbadense series of characters. Their behaviour in India is of lees consideration, since all American cottons degenerate rapidly in this country and often assume perfectly new, though inferior, forms. The acclimatised New Orleans cotton of India has lost, for example, many of its original properties, but is as distinct as ever from either of its suggested ancestors.

COTTON.

COTTON. References.—J. H. Van Linschoten, Voyage to the East Indies {1598), I; SS* 'P> Dunlop, the Cotton Trade, 1862; Arnold, History of the Cot' ton Famine, 1865; Watts, the Cotton Supply Association, iSyt; Annual Reports of the Cotton Supply Association ; Donnelly History of Cotton, 1872; Royle, Culture ana Commerce of Cotton in India, i8\$r; Prod, Res., 12, 42, 67, 75» 7#. 84 214, 221; Aytoun, Origin and Distrib.of Cotton Soils of India; Forbes Watson, Rep. on Cotton Gins, and Clean-ing and Q uality of Indian Cotton ; Rivett-Carnac, Minute on Cultivation ot Cotton ; Medlicott, Cotton Handbook for Bengal, 1862; Moore, East Indian Cotton, its Adulterations, and Acts passed to suppress the same, 1872; Schdfieldy Note on Ind. Cot., 1888; Reports of Proc. of East Ind, Co., on Cot., 1836; Numerous Official Repts., and Cor., Rev. & Agri. Dept., Govt. of India; Parly. Papers :—On Cotton exported from In-dia, 1847: On Measures taken to Improve Cotton Cultivation xn India, 1857; Cotton Cultivation in India and Prospect of Supplies to England, 1863; The Cotton Supply Reporter ; Ure, Cotton Manufactures, 1861.

HISTORY.

Perhaps no more remarkable example of a sudden development exists in the whole history of Economic Products, than in the case of cotton. The enormous importance, at the present day, of the fibre in the agriculture, trade, manufactures, and daily wants of the people of nearly the whole world, render it difficult to believe that only a few hundred years ago cotton and its products were practically unknown to the civilised nations of the West.

But it is perhaps even more singular that a fibre which has for centuries been the staple article of clothing in India, and elsewhere in the East, should scarcely find a place in the early classical literature of these Nearly all the beautiful and the useful plants of India, if not countries. of Asia, have their" properties extolled by the Sanskrit poets, and indeed are frequently dedicated to the gods, but cotton—the plant above all others which might be expected to have formed a theme for nature worship—is passed by, with only the most incidental allusions to its properties. Indeed, it is only in modern works that the fibre is unmistakeably referred to. Evidences exist, however, amongst certain of the aboriginal tribes of Ind'a of what is perhaps a much more ancient knowledge of the plant. For example, the Khonds grow a cotton-bush in the place selected for a new

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(Watt & Murray) GOSSYPIUM.

settlement, and in after years the village plant is tended as sacred and carefully watered. This custom is probably of very ancient origin, and may denote a superstitious regard for the plant, probably derived from the knowledge and appreciation of its valuable properties.	HISTORY.
The Sanskrit word translated " cotton " is perhaps first mentioned in the Institutes of Manu, where, in <i>Book II., No. 44</i> , it is stated that, "the sacrificial thread of a Brahman must be made of cotton, so as to be put on over his head in three strings." The word used in that passage and trans- lated cotton is <iiimitft (<i="">kdrpdsi) from which has been derived, accord- ing *o most writers, the modern Hindustani <i>kapds</i>, and even the Hebrew <i>karpds</i> (the "green hangings " of the Book of Esther). The frequent con- fusion in ancient classical terms for textile fibres, which will be further commented on below, has led many to believe that the <i>kdrpdsi</i> of the Insti- tutes of Manu may not necessarily have been cotton. The probability, however, is that it really was so. Not only does the term in general use for cotton at the present day evidently owe its origin to that word, but the brah- minical threads are, up to the present date, made almost, if not quite, exclusively from the fibre of G. arboreum, a plant, in many parts, considered the exclusive property of the Brahmans, and generally planted near tem-</iiimitft>	Cotton in Sanskrit Literature.
ples, or the abodes 01 fakirs. Be this as it may, it is certain that at the time of the Institutes of Manu spinning and weaving were not only known, but the art of starching or weighting a textile was also practised, and the admissible amount pre- scribed. In <i>Book VHL, No. 236</i> , it is enjoined that for "stealing thread, raw cotton, materials for making spirituous liquors, &c," the fine should be "thrice the value of the article stolen. Again, at <i>No. 397, "</i> Let a weaver, who has received ten <i>palas</i> of cotton thread, give them back increased to eleven by the rice water, and the like used in weaving; he who does other- wise shall pay a fine of twelve panas." A still earlier notice of the process of starching probably occurs in the <i>Rig Veda, Hymn</i> 705, <i>v. 8,</i> where the following is to be found: "Cares consume me Satakratu, although thy wor- shipper, as a rat gnaws a weaver's thread." Commentators have explain- ed that the rat's temptation was probably the starch, in which the threads had been steeped to improve their tenacity and strengthen the fabric. The picture thus raised of the character of the textile industries of India, some two thousand years ago, meets its parallel only in the injunctions laid down for domestic life. <i>Book VIII., No. 3g6, of the Institutes of Manu</i>	
deals with the regulations concerning washermen. "Let a washerman wash the clothes of his employers by little and little, or piece by piece, and not hastily, on a smooth board of <i>Sdlmali-v/ood</i> : let him never mix the clothes of one person with the clothes of another, nor suffer any but the owner to wear them." (For <i>Sdlmali-wood cf.</i> with Bombast and Erioden- dron.) We are thus led to believe that not only were spinning and weaving fully understood, but that a civilisation existed in that early age, in which the social habits of the people differed little from those of the present day. Accepting as correct the interpretation of the early <i>kdrpdsi</i> as cotton, we have no alternative but to believe that the arts of spinning and weaving jvere perfectly understood in the East, at a time when the textile industries of the West, through ignorance of cotton, were in a much more backward condition.	
It is extremely difficult if not quite impossible to determine the earliest of	iotton in arly classical iterature.

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	History	of	Cotton.*
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HISTORY. bic Kurpas (probably derived from the Sanskrit), the modern kutn fijiaj and panbah AAJU, of the Persians are all now translated cotton, though their original meaning is doubtful. In Greek the word *karpason* is generally translated "cotton," but has often been rendered " flax." The /3td<ro-o? of the early Greeks was the fine linen used for making mummy cloths, but by later writers it was applied to cotton. The words K(vov and linum have sometimes been translated "cotton," just as karpason has often been rendered "flax." Yates (in his Textrinum Antiquorum) says that some poets assume a license in the use of the word carbasus, and Dr. Robertson points out that doubt may be admissible as to whether cotton was even known to the early Romans, since garments made of that fibre are nowhere specified in the laws de Publicanis et Vectigalibus, while, on the other hand, imported spices and precious stones find a recognised place. It may also be viewed as significant that, with writers at the beginning of the Christian era, it was customary to speak of cotton and cotton goods by names not in use prior to that date. Thus Pfiny refers to the Gossypinos or Gossypion of the island of Tylos, and a misapplication of a term derived from silk became general, Bambacinus (made of cotton), Bambacarius (cotton dealer), &c. e.e. *Bombax* is the generic name given by botanists to the silk-cotton tree. It is thus evident that no reliance can be placed on any of the terms above mentioned as necessarily meaning " cotton," and that it is only possible to identify a reference to it by the context. Herodotus is perhaps the first who seems to refer to the fibre. In his account of India he writes, " The wild trees of that country bear fleeces as their fruit, surpassing those of sheep in beauty and excellence; and the Indians use cloth made from these trees." He further states that the cuirass sent by Amasis, King of Egypt, to Sparta, was " adorned with gold and with fleeces from trees." Ctisias, the contemporary of Herodotus, was also acquainted with cloth made from tree-wool. **^But perhaps the first unmistakeable reference to cotton is by Theo**phrastus, subsequent to the expedition of Alexander into India. Me describes the trees from which the Indians made cloth, as " having a leaf like that of a black mulberry, the whole plant resembling the dog-rose. They set them in the plains arranged in rows, so as to IOOK like vines in a The plant thus described is unmistakeably cotton, and the distance." passage indicates that not only was the fibre known, but that the plant was cultivated, at least in North-Western India, at that early date. Nearchus described the garments made from this tree-wool, stating that the natives wore a cloth " which reached to the middle of the leg, a sheet folded about the shoulders, and a turban rolled round the head," a description which accurately describes the clothing of the people of many parts of the country at the present day. Cotton as an The first mention of cotton, considered as an article of commerce, is article of found in "the Periplus of the Erythraean Sea," by Arrian, who probably Commerce. lived towards the end of the first century. That writer, who was at the same time a merchant and traveller, sailed over the whole of the Arabian Sea, and described in detail the articles of trade of many of the corst towns of India. According to Arrian it appears that, in his time, the Arabs exported Indian cotton to Aduli, a port on the Red Sea, and that a trade was established with Patiala, Ariake, and Barygaza—the modern Broach. From the latter a great quantity of cotton cloth, made in the neighbourhood and also obtained from the remote parts of the country, was exported, Masulia, the modern Masulipatam, was also then, as it is to this day, famous for the manufacture of excellent cotton stuffs. The muslins of

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HISTORY. Dacca seem also to have been known. They are described as superior to all others, and are said to have been called gangitiki by the Greeks, a name indicative of their manufacture on the banks of the Ganges.

The knowledge of the manufacture of cotton appears to have extended into Arabia and Persia about the beginning of the Christian era. From these countries cloth locally manufactured, or imported thence from India, may have found its way to Rome and the richer cities of the Greeks. But such supplies must have been very rarely obtained, and the silence of classical authors on the subject is a proof of the want of regular imports of the material. Even after regular commercial intercourse had been established between Rome and the East, cotton, considered as a material capable of being woven, appears to have excited little interest. It may in fact be inferred from the silence of writers of the middle ages that cotton was even then but little known. While they write in full detail of 4he ordinary articles of clothing, of wool, linen, and silk, they make no mention of cotton.

From India, there is no doubt, the cultivation of cotton spread into Persia, Arabia, and Egypt, from whence it probably extended into Central and Western Africa. From Persia the culture migrated into Syria and Asia Minor, also into Turkey in Europe, and thence into other parts of Southern Europe. It is doubtful at what period the plant first crossed the Mediterranean, but the earliest account of its cultivation on the European shores, is to be found in the works of Eben el Awan of Seville, who lived in the twelfth century. He describes the method employed in Sicily and Spain, to which the plant had doubtless been brought by the Arabs. About theeame period cotton stuffs, manufactured in Turkestan and by the Armenians, became an important article of commerce between Asia and the Crimea.

On its arrival in Europe, cotton-wool was first employed in the manufacture of paper, and for padding quilts, cushions, &c. The art of spinning its short staple was only learnt in Europe after the delicate manufactures of the East had permeated the whole world. Thus, long beforS any mention is made of cotton manufacture in Europe, records exist of paper made of cotton being commonly used at Cambridge.

But more astonishing still than the slow progress of cotton to Europe is the fact that China, which, from very remote times, held intimate commercial intercourse with India, should have known nothing of the arts of culture and manufacture of cotton until the thirteenth century, when they were introduced into that empire by the Mongol-Tartar dynasty. Two Arabian travellers who visited China in the ninth century observed, "The Chinese dress, not in cotton as the Arabians do, but in silk." In the sixth century records exist that the Emperor Ou-ti possessed a robe of cotton, which had probably been presented by some foreign ambassador, and was held in great esteem. Towards the end of the seventh century it is known that the plant was grown in gardens for the beauty of its flowers. At first, as in England, there was great opposition to the new staple, but the cultivation gradually increased, until it reached its present importance, being now in China as in India a valued crop. The quantity produced annually as been estimated at as much as 12,000,000 bales. Whether that be a correct estimate of Chinese production or not, the outturn must be enormous, since the lower orders (now-a-days) are all clothed in cotton.

Turning to the New World, we find that cotton has probably been used from the earliest times. It is connected with some of the most ancient beliefs of the aboriginal peoples of South America. Thus, M. Agassiz in his work on Brazil, recounts a strange legend respecting the cotton plant according to which Caro Sacarbu, the first of men and a demi-god, pulled'

Spread of Cotton-to Europe,

to China.

Cotton in the New World.

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Spread of the Cotton Industries. History of Cotton:

the ancestors of the human race from the bowels of the earth by means of a cotton rope. Columbus found cotton in use among the natives of Hispaniola, but only in the most primitive way. Cortez found the manufacture in a much more advanced condition in Mexico. The Spanish historian informs us that" The Mexicans made large webs, as delicate and fine as those of Holland. They wove their cloths of different figures and colours, representing different animals and flowers. Of feathers interwoven with cotton they made mantles and bed curtains, carpets, gowns, and other things, not less soft than beautiful. With cotton also they interwove the finest hair of the belly of rabbits and hares, after having spun it into thread; of this they made most beautiful cloths, and in particular winter waistcoats, for their lords."

With the rise of Muhammadanism and the conquests of the Saracens, the knowledge of spinning and weaving cotton probably spread to Europe, consequently we find the delicate cotton fabrics of the Efst first imitated in Italy and Spain, during the twelfth or thirteenth century. From these localities the art of cotton manufacture became diffused and extensively established all along the Southern shores of the Mediterranean, but it was confined to that area till the sixteenth century. The Dutch then succeeded in depriving the Portuguese of their Eastern colonies, and not only extended their own imports of cotton goods, but, towards the end of the century, began to manufacture at home.

From the Low Countries the industry passed over to England in the seventeenth century. On the arrival of cotton goods at the Mediterranean ports, these fabrics became known and valued in England, and gave rise to imitation. Thus Cam den, writing of Manchester in 1590, says, * This town excels the towns immediately around it in handsomeness, populousness, woollen manufacture, market place, church, and college, but did much more excel them in the last age, as well as by the glory of its woollen cloths, which they call,' Manchester cottons.' " In 164.1 Roberts, in his "Treasure of Traffic," writes, "The town of Manchester buys cot*on wool from London, that comes from Cyprus and Smyrna and works the same into fustians, yermillions, and dimities." About this time, however, calicoes began to be imported in greater quantities from Holland, Portugal, and also from India direct, with the result that Indian chintzes became so generally worn (to the detriment of the woollen and flaxen manufactures at home) as to excite popular feeling against them. Disputes arose as to the question of duty on these goods. Thus, in 1664, Pepys writes in his diary, "Sir Martin Noel told us the dispute between' him, as framer of the additional duty, and the East India Company, whether calico be linen or no, which he says it is, having ever been returned so. They say it is made of cotton wool and grows upon trees." In 1678 complaints from those interested in woollen manufactures became louder and a pamphlet was issued, called " The Ancient Trades Decayed and Repaired again," lamenting the detrimental effect of imported cottons. This dissatisfaction steadily increased, till, in 1700, Acts were passed wKch prohibited the introduction of printed calicoes for domestic use, either as apparel or furniture, under a penalty of ^ 200 on the wearer or seller. But this did not prevent the continued use of cotton goods, qiintities of which were smuggled into the country.

Towards the end of the seventeenth century cotton printing was established in England, and English prints began to combine with Indian in ousting woollen goods. Thus in 1708 the *Weekly Review* of Daniel De Foe contained the statement that " above half of the woollen manufacture was entirely lost, half of the people scattered and ruined, and all this by the interference of the East India Trade." Dissatisfaction increased, till in * History of Cotton.

(Watt & Murray.) GOSSYPIUM.

1720, an Act was passed prohibiting altogether " the *use* or *wear* in Great Britain, in any garment or apparel whatsoever, of any printed, painted, stained, or dyed calico, under the penalty of forfeiting to the informer the sum of $\pounds 5$." By the same Act the use of printed or dyed calicoes, " in or about any bed, chair, cushion, window curtain, or any other sort of household stuff or furniture," was forbidden under a penalty of $\pounds 20$, and the same attached to the seller of the article. This Act, however, though confirmed in 1721, appears to have had little permanent effect, since in 1728 we find another author writing of the prevalent evil of the consumption of Indian cotton manufactures, which he ascribed to the " passion of ladies for their fashion."

In 1736 the law, since it struck at the existence of the now rising cotton manufactures of England, was modified so far as to permit the manufacture of calicoes "provided the warp thereof is entirely made of linen thread."

During the succeeding thirty years the mechanical achievements of Wyatt Kay, Hargreaves, and Arkwright, by reducing the cost of manufacture, and contributing to the production of more perfect and cheaper fabrics, placed the English manufacturer in a position to dispense with a considerable proportion of the protective legislation which previously existed. Accordingly, a law was passed in 1774, sanctioning the manufacture of purely cotton goods, rendering English calicoes subject to a duty of 3d. per square yard, but still prohibiting the importation of such goods. The numerous inventions perfected about the end of the eighteenth century, together with the withdrawal of restriction in manufacture, led to so wonderful a development of the cotton trade, that it became not only necessary to seek new markets for English manufactures, but also for more abundant supplies of the raw material. In 1697 the amount of cotton imported into England was 1,976,359 ft, up to 17491/it did not materially increase, in 1751 it was 2,976,610ft, the average from 1771 to 1775 was 45764.589ft; but from 1796 to 1800 it increased to the annual amount of 37>350>276ft. At this period the West Indies appear to have bec9me the best and largest source of supply, and prices seem to have ranged from 2od. to 301/. per ft, though in 1799 the average price of West India and Barbias extra was as bight of 272 per ft and Berbice cotton was as high as 37c?. per ft.

Up to the commencement of the present century America contributed but a very insignificant portion of the cotton consumed. It is stated that "in 17S4 an American ship, which had imported eight bags of cotton into Liverpool, was seized, on the plea that so much cotton could not be the produce of the United States." The imports from America in fact continued to be very small up to the end of the century. In 1790, for example, Europe received 18 bags; in 1791 the total exports of cotton from the United States were 189,316ft, but in 1794 they amounted to 1,601,700ft, and by the year 1800 they had increased to nearly 18,000,000ft.

At the close of the war in 1815, when prospects of foreign trade began to brighten and to lead to an increased demand, the production of cotton in America received a fresh impetus, and the subsequent progress was rrpid and continuous. The lead then taken by the Southern States was A steadily maintained for nearly half a century, and a practical monopoly was eventually established. With increased production came lower prices; cotton worth 22d. per ft two years before fell in 1819 to *is.*, in 1848 to 4|rf. per ft.^

This great increase in the importance of America, as a cotton-growing country, early led the Directors of the Honourable East India Company to commence operations for the purpose of improving the quality and increasing **the** quantity of Indian cotton for export to England. Full information

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regarding cultivation and trade was called for as early as 1788. In 1790 numerous reports were received which showed the chief districts of the several provinces in which cott6n cultivation was then carried on, and recorded many interesting facts regarding the methods of cultivation. In a "Report on the Proceedings of the East India Company in regard to the Production of Cotton Wool" the following passage occurs:—" From this period great attention was bestowed with a view to the production of a larger and better supply of cotton in the provinces under the Company's Government, as well for the advantage of the native cultivators and manufacturers, as for the benefit of Great Britain. Endeavours were made to prevent adulteration in the cotton purchased from the native merchants; and in order to reduce the expense of freight, screws for compression were brought into successful use, and subsequently carried to great perfection."

The imports into Great Britain from India during the years 1800 to *iSog* averaged 12,700 bales per annum; and owing to the influence on the cotton trade of the American embargo in 1808, the quantity brought over in 1810 amounted to 79,000 bales (27,783,700ft). "In 1818 the export to the United Kingdom amounted to 247,300 bales (86,555,0001b)—the largest quantity exported from India up to 1833." The report continues, "In the import of every year there was generally among the consignments some good clean cotton; but the greater proportion was not suitable for spinning in this country, and was therefore re-exported to the Continent." The Company persevered in their energetic measures for the improvement of Indian cotton, but without much success.

The final result of the contest between America and India in cotton supply is too well known to require any recapitulation in this place. From 1818 onwards the respective quantities of Indian and American cotton in the English market never again approached each other till about the time of the American war. During the first fifty years of the present century, Indian cotton exports were characterised by the most extraordinary fluc-Thus in 1821 the imports from India had fallen to 20,000 tuations. bales; in 1841 they rose to 278,000 bales; in 1848 they again sank to 49,000 bales. America, in short, had gained command of the market, and India was considered only as a supplementary source of supply, resorted to mainly in the event of a short crop from the West. It was not till the blockade of the Southern Ports, during the American civil war, that India again became one of the main sources of supply to the English cotton market. The effect of that war is not only shown by the increase of I ndiair exports but by the extraordinary rise in value. Thus, previous to war, Indian cotton sold for between 2 and 3 annas per pound, and during the crisis attained the high value of II annas 5 pie. With the recovery of American trade, Indian cotton again decreased to its normal value and has since fluctuated between 4 pence and six pence a pound. The following analytical tablesof the imports into Great Britain, and statement of prices will perhaps, however, exhibit, in the shortest way, the striking fluctuat tions of the American and Indian trades during the ten years previous to and following the War of Secession :---

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				1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
America .	•	•	•	1,182,970	1,397,112	1,788,685	1,532,063	1,666,479	1*623,478	1,758,295	1,481,715	1,863,147	2,086,124
India • •	•	•	•	309,168	326,474	212,361	485,527	308,293	396,014	463*932	680,466	360,980	509,695
Brazil • .	•	•	•	171*359	108,670	144,214	132*443	107,393	134,762	122,411	168,340	106,127	124,930
Egypt . •	•	•	•	79,376	63,833	189,865	105,398	81,085	115,018	112,911	75,598	105,603	101,427
Smyrna. •	•	•	•	157	3*630	20		•••		•••		500	1,700
Peru . •		•	•	•••	47	90	2,879	>,637	1 ,44 1	4*300	3*788	1,812	1,496
West Indies, &	. •	•	•	5,107	4,799	12,043	5,960	7,710	7,505	7,020	7*679	4,460	3,528
	тот	ſAL	•	1,748,137	1,904,565	2,357,278	2,264,270	2,172,597	2,278,218	2,468,869	2,417*586	2,442,629	2,828,900
TOTAL IN BA EACH.	LES	OF 4	00ft	1,714,000	1,900,250	^,313,000	2,255*750	2,216,500	2,252,750	2,552,500	2,440,250	2,563,750	2,977,000
PRICES OF IND ANNAS PER tt>		OTTON	I IN				•••	2—3	Not given.	2—3	2—8	3	2—7

Imports of Raw Cotton into the United Kingdom, in Bales, during the ten years previous to the American War, viz., from

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America			2,580,980	1,841,643	72,369	m	197,776	460,606	1,162,745	1,225,686	1,269,060	1,039,641	1,664,010
ndia •	•		562,738	986,290	۲ 1,071.768	1,229,984	i,399,5i4	1,266,513	1,847,759	i,50S,754	i,45i,979	1,496,426	1,063,540
Brazil•		•	103,084	99,224	133*807	I37,M2	212,192	340,261	407,646	437,208	636,897	514,200	402,760
Egypt .			110,009	97,759	i35,420	205,788	257,102	333,575	167,451	181,173	188,689	185,670	219,920 •
Smyrna			100	957	14.85'	42,282	61,''93	79,803	32,770	i6,995	12,758	40*957	.*•
eru•			2,5'5	2,667	5*400	15,521	27,059	71,794	49,081	64,423	58,881	62,228	
Thina and	Japar		•••			160,807	399,074	141,610	18,844	1,942	93		.*.
Vest Indie			7*259	7*i88	n*436	8,610	32,586	61,159	62,745	64,593	4i,77o	43,042	112,100
тот	,		3,366,685		 i,445*05i	1,932,153	2,587,096	2,755,321	3,749,o4i	3,500,774	3,660,127	3,382,164	3*462,330
OTAL IN			3*589,500	3,i53,500	i,332,750	1,729,500	2,240,250	2,416,000	3.384.500	3,i56,340	3,320,210	3,053,067	3,289,214
ÖF 400ft RICES OF	ĒÁĊĦ	.	3-7	4-2	6-4		 II-5		6-2	· 1 5-* · 3	4—7	5-6	5-5

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history of Cotton. (Watt & Murray) GOSSYPIUM

The causes of the decline of India's hold on the European market, during the first half of this century, are abundantly shown in every report on the subject. Imperfections in methods of picking, cleaning, and packing, together with extensive adulteration, rendered many of the Indian consignments practically valueless, and largely increased the demand for the clean American cottons, which thus rapidly obtained a stronger hold on the market. The great development in machinery, which coincidently took place, resulted in improvements being directed towards the utilisation of the clean, long-stapled, high quality American cottons. As a consequence, the short-stapled Indian flosses soon became entirely unsuited for Énglish machinery, and thus their market price rapidly fell. With diminished prices, and a bad name, inducement to improve the quality of consignments became less and less, till such a statement as the following became only too true:—" An inferior and dirty article is by far the most profitable artktle of native trade, even so to European merchants.'

Notwithstanding many endeavours on the part of the East India Company, but little improvement was effected. In 1829 a Regulation(III. of that year) was introduced for the suppression of the adulteration of cotton, but with no practical result. Attempts were therefore directed towards the improvement of Indian cotton by the introduction of American seed-attempts which were energetically aided by the Agri.-Horticultural Society of India, and by many private individuals. Thus, in 1830, the Society started a farm of 500 big has at Akra, near Calcutta, for the experimental cultivation of cotton. This endeavour was prosecuted, and acclimatised seed freely distributed till June 1833, when the lease of the farm'having expired, the Society did not deem it necessary to keep up the establishment. In 1837, £200 of the Society's money was set apart for procuring seed, and an annual grant of R 1,000 voted for the same purpose. And the whole of that amount was ordered to be expended on Upland Georgian. The earlier publications of the Society in fact teem with accounts of similar patriotic efforts.

In 1838, ten experienced planters were procured by Government, from the Southern States of America, for the purpose of establishing the cultivation of New Orleans cotton. They were furnished with seeds, ploughs, hoes, and gins, and began operations about 1840-41. Three were»stationed in Bombay, chiefly at Broach; three in Madras, at Tinnevelly and afterwards at Coimbatore; and the remaining four, sent to Bengal, commenced experimental cultivation in the Doab and Bandelkhand. With varying success these cotton farmers continued their efforts, until it became manifest that permanent improvements were not likely to be attained. Besides many natural difficulties, much opposition from the natives was encountered. This was overcome in Dharwar only, the one great instance of success, by the personal influence of the Collector and his assistants. For a full account of these experiments the reader is referred to the publications of the Agri.-Horticultural Society of India.

Notwithstanding the want of success which attended these endeavours, a firm conviction was still entertained that the speediest and surest way to the improvement of Indian cotton was by the extensive use of exotic seed. Large qua*tities were accordingly sent to India by the Cotton Supply Association, and were also distributed by the Agri.-Horticultural Society of India, but with the old result of general failure. Up to the date of the American war, and the consequent cotton famine, it appeared as if Indian cotton would be gradually driven out of the market. At that time, however, merchants in Europe naturally turned to this country for a great part of their supply, and energetic efforts were renewed by Government to meet the demand and improve the quality. These endeavours were materially

HISTORY.

Causes of decline in Engli sh Imports of Indian Cotton.

Review of Area. Outturn. and Consumption

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HISTORY. For an account of the working of that Act, Conf with **pp.** 72— 78.

> CULTIVA-TION. Area and Outturn. **70**

aided by private enterprise; notably so by the English Cotton Supply Association. In 1863 a Cotton Commissioner was appointed in the ^{Bom} ME Presidency; in 1864 a similar appointment was made for Berar ana the Central Provinces. A Cotton Frauds Bill was submitted in 1862-03, and

became law as the Bombay Cotton Frauds Act, IX. of 1863. In conclusion it may be said that experiments on the introduction of American seed have been steadily kept up at the Government Farms DUe with little success, and of late years attention has been consequently moand more directed towards improving the Indian staple, by careful 1 seiection of seed and adoption of the best methods of cultivation. Since the reestablishment of the native staple in European markets, consequent on the cotton famine, it has been found that a good market does exist. An exports have remained fairly steady, and should the staple not furthe deteriorate, they are likely to continue regular.

The reader is referred to the article on "TRADE " for information as to the present position of India as a cotton-exporting country. The remarKable increase since 1862, and the present immense importance of the exports, render it manifest that every effort ought to be made to retain ana expand a trade of so much value to this country.

CULTIVATION OF COTTON IN INDIA.

REVIEW OF AREA, OUTTURN, AND CONSUMPTION.

The statistics of area of agricultural crops in India are year by year being brought to a state of greater completion. In the case of cotton special attention has been paid to the subject, with the result that the figures now given* are believed to be fairly accurate. This remark appn^e to most of the provinces and Native States in India, with the exception of Bengal, a province regarding which the available information as to area and outturn is of the most meagre character. An attempt was, however, made, some few years ago, to determine the Bengal area and outturn Of cotton, and the figures then published have had to be accepted in the pre-•sent statement, for the year 1888-89, though everything points to their being under rather than over the mark. In a "Note" on cotton cultivation issued by the Government of India, in 1888, the average area for the-five years preceding 1885-86, was put down at 14,051,800 acres, and the outturn at 6,775,000 cwts. of cleaned cotton. For most provinces of India a certain reduction (as far as possible allowed for in this article) has to be made, owing to the fact that a considerable percentage of the cotton lands is regularly occupied with mixed crops, viz., one or two rows of cotton alternating with a row of one or other of the bushy pulses or some such crop which can conveniently be grown on the same field with cotton. The estimate of yield has, in many provinces, been arrived at, after the conduction of careful crop experiments, and these, on the whole, have demonstrated that in former returns the yield was understated. Moreover, for the races and hybrids of indigenous cotton (Gossypium herbaceum and G. Wightianum), it is now generally accepted that 30: 100 is a safer estimate of cleaned from uncleaned" cotton than 25: 100 as previously allowed. Accepting these opinions as correct, the area under cotton in 1888-89 was 13,998,639 acres, and the outturn 9,219493 cwt. This rxhibits a decrease in the area but an increase in the outturn of approximately 2,500,000 cwt. of cleaned cotton over that given in the "Note" above alluded to. It is believed that these results indicate a departure of a more superficial than actual character, however, being the adjustment

[•] T^{he} year 1888 89 has been chosen (though later figures of foreign trade are available), because it is the last for which corresponding Agricultural and Internal Trade Statistics are obtainable.

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of the error arising from mixed crops, which would restrict the area CULTIVAactually occupied by the crop but raise the acreage outturn. Indeed, it seems probable that, instead of the cultivation of cotton having declined, Area & Outturn• as the figures given above might be supposed to indicate, it is actually on the increase, and greatly owing to the favour shown for mixed crop cultivation. For example, if the standard of least error be taken in determining this point, viz., the total consumption of Indian cotton in the home and foreign markets, we learn that the exports (as a direct result of the American War) suddenly expanded. In 1865-66, they attained the magnitude of 7,170,986 cwt., valued at 1*35,58,73,890. In the year previous, though the quantity exported was only 4,687,972 cwt., the greatest recorded value was then obtained, viz., 837*57,36,370. From the date of the War of Secession the exports declined, till in 1869-70 the? amounted to only 4,953,379 cwt. They again, however, recovered, and attained, in 1871-72, their maximum quantity, namely, 7,225,411 cwt.; but it is noteworthy that this remarkable production of Indian cotton decreased rather than increased the value, for the exports were then declared at only £21,27,24,297. From 1871-72, the exports declined once more and reached their lowest recorded level in 1878-79, a year of famine, when they were 2,966,060 cwt., valued at 87,91,30,458. Since that date they have steadily improved, having been, in 1885-86, 4,189,718 cwt.; in 1886-87, 5>432,648 cwt.; in 1887-88,5,374,542 °wt.; in 1888-89,5,331,904 cwt.; and in 1889-90, 6.328.898 cwt. It may thus be admitted that the foreign exports justify the opinion of an expansion in the production of cotton, the more so since the consumption by Indian mills has manifested during the past five years,—indeed during the past thirty years—a corre-sponding steady increase. The statistics of these mills showed, during the five years ending 1866-67, an average annual consumption of only 210,000 cwt., while last year they took 3,111,024 cwt., being an increase in twentytwo years of 1,381! per cent. These facts may thus be admitted to afford a tangible conception of the cultivation of cotton in India, which can Se elaborated by a review of the figures of internal and foreign trade. Working back from the returns of marine and rail-borne traffic, for example, a powerful confirmation is obtained of the accuracy of the agricultural statistics (in the case of surveyed provinces), and accepting the data thereby arrived at, it becomes possible to fill up approximately accurate figures for such provinces as Bengal, which publish only generalisations regarding their area and outturn of crops. Some years ago an attempt was made to register the road traffic to and from the larger cities of India. This was found both troublesome and expensive and had accordingly to be abandoned. But the more important railways having fallen into the hands of Government, an arrangement has been made by which each province is divided into certain blocks. The interchange of "produce between these blocks is carefully recorded and the traffic published annually. A similar system of registration on rivers and canals having been organised, it has thus, during the past few years at least, become possible to form a fairly clear idea of the major portion of the internal trad ' of the country. Had it been possible to carry out a registration of road trade, an even "more complete conception of outturn would have been derivable from the movements of produce from district to district and province to province. But by bearing in mind the error involved through want of road statistics we are, nevertheless, in a position to arrive at a fairly accurate idea of the intra- and inter- provincial transactions, from the annual reports of the rail, river, and canal traffic. A provincial balance sheet of imports and exports, doubtless, ignores at the same time local consumption, since a product, such as cotton, may be conveyed a few

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Area & Outturn,

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p. 161.

Review of Area, Outturn, and Consumption

miles from the field to the loom without being carried over any possible registration route. The amounts thus locally consumed would, therefore, escape registration, however carefully road traffic was recorded, but by various analytical methods, figures have been derived, which are believed to approximately express local consumption. The accuracy of these estimates is, indeed, confirmed by an analysis of all trade transactions. net exports over imports being deducted from outturn, the balance shown would be available for local consumption, and that balance, in most cases, represents the actual figure stipulated for by official estimates as the amount requisite. It need only be here added, in this connection, that the most serious error, involved in all tabular statements of the production ana trade in cotton, is due to the season of cultivation and harvest not corresponding to the official year in trade statistics. It does not follow, for example, that the area shown as under cotton, in any one year, ahordea the whole supply for the trade of the same period. Indeed, an annijaj statement for twelve months ending 30th June (the cotton commercial year), would be more correct than a year ending 31st March—the official year. By such an arrangement, however, the relation of the cotton production to the imports and exports of raw cotton and piece goods would be lost sight of. The error here indicated is, at the same time, one that admits of correction by the average of a series of official years being compared with a corresponding average of commercial returns. As this involves, however, considerable labour, scarcely commensurate with the advantages gained, the authors have in the present review of the Indian Cotton Trade preferred to adhere to the official year, even though aware that the transactions in rail, river, canal, and marine returns, for the first few months of each year, refer mostly to the previous year's crop. explained above, this is due to the official year closing in March, whereas the whole of the crop is not in the market before the end of June. Allow''' Jng for this error and for the want of road statistics, it is believed that *the internal transactions in cotton under rail, river, and canal traffic, confirm the agricultural statistics of area, outturn, and local consumption, just as the returns of internal trade are again confirmed by the foreign exports from India.

In 1869, Mr. H. Rivett-Carnac (then Cotton Commissioner for the Central Provinces and Berar) estimated the Indian consumption of cotton at fcoo.ooo bales (of 3[^] cwt.). There were in all only seventeen mills at work in that year, and these used 90,000 bales, so that the local consumption for hand-looms and all other purposes, would on that estimate have been 510,000 bales, or 1,785,000 cwt. The author of the valuable work "Indian Cotton Statistics" has proved satisfactorily that the annual average production of cotton in India at the present day is a little over 2,600,000 bales, or 9,100,000 cwt. There are now at work 124 mills in India, and last commercial year these worked up 388,654 bales. The foreign exports from India, during the official year (which in part only corresponds to the commercial year), were 1,523,401 bales. If it be admissible to add these two quantities together and deduct the total from the estimated average annual production, there would have bep*)left for local consumption in all India, during the year 1888-89, 1871945 ^a'f or 657,807 cwt., a quantity which, there are grounds for believing, would have been considerably under the actual requirements of the country. But the above estimate does not take into account the foreign and transfrontier imports, and thus deals with actual foreign exports, not net exports, from the country. The outturn, according to the most recent official returns, was, besides, about 120,000 cwt., in excess of the estimated average, so that it seems safe to add that the actual supply was

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<u> </u>	of Cotton in India.	(Watt & Murray.)	GOSSYPIUM
If this assumption be	00 cwt.) in excess of the correct, India consumed, ptice, close on 1,000,000 cwt	, other than by mills	$\mathbf{S}_{\mathbf{S}}_{\mathbf{S}_{\mathbf{S}_{\mathbf{S}_{\mathbf{S}_{\mathbf{S}_{\mathbf{S}}_{\mathbf{S}_{\mathbf{S}_{\mathbf{S}}}}}}}}}}$
consumption of cotton sent estimated consump th£ extension of mills foreign piece goods by of cotton, as used up p amount of Indian mil goods and yarns brougl ever, to the population of Royle (<i>Culture and Co</i> estimate showing that 55 of clothing worn in Indi adult population. Acc infants as balancing the 250,000,000, consuming cloth, or, correcting this spinning and weaving, cotton. A calculation of investigators with practi- determined that on the cotton. A man and we cloth or 8ffi of cotton. The people of India using Adding to that, the min- would require in all 6,00 a liberal estimate of ann The following abstr to bring together the r whole of India. It show from the producing are 2,426,980 for local har Of these provincial expl accordingly shown as im stock from which the f the mills in the port tow as yarns or piece good goods, constitutes the st Jiai -*-loom manufactures vinces are less than the siderations : (1) the supp of the crop of 1887-88. during the official year of these months in the tw may be; (2) the absence	Countries a according to Mr. H. Rivett in 1869-70 was considerab- tion, but this is doubtless a in India and of the increa- certain classes. The est er annum in India, exclude l piece goods and yarns, at into the country. 'That a of 250 millions, would be <i>mmerce of Cotton in Ind</i> t of cotton cloth or 32 £ ya is by a man and his wife epting the lesser requirement greater demands of the we 2 Jib per head, would rea- t to raw cotton by adding they would annually use f total consumption has bee cally the same result. It average five yards of clo oman with two children wo The average of these two c- a little over 3,200,000,000 for uses of cotton (upholst 0,000 cwt. of raw cotton, an ual consumption. act statement for the year nain facts regarding the r ws an outturn of 9,219,493 eas of 6,792,503 cwt., thus d-loom and mill consump- orts nearly the whole goes to ports to the ports. These oreign exports are drawn in forming a balance whic ls to the provinces, and, to upply of cotton used by the s. It will be observed the n imports by the towns; but olies in April, May, and Jun They w» re thus not drawr of 1888-89, and the difference to years has to be added e of road statistics doubtle appears in the sea-coast tr	bly in excess of the pre- direct consequence of asing favour shown for imate of 1,000,000 cw es from consideration the also of foreign piece amount expressed, how about O45flb per head of the publishes and rds is about the amount e, or 2ft> per head of ents of the juveniles and ell-to-do, a population of quire 5,580,357 cwt. of 3 per cent, for loss in e up 5,747,767 cwt. of en made by more recent has, for example, beer obt go to the pound of ould require 40 yardi of alculations points to the yards of cotton cloth ery, lamps, &c), they not this is very probably r 1888-89 ^w *^ be found aw cotton trade of the cwt., with a net export s leaving a balance of ption in the provinces to the port towns and i imports constitute the the amounts used by h largely returns again ogether with the foreign e people of India over et exports from the pro- this is due to two con- te were the last portions of from the area cropped conducted as the case as brings into the port	f f f f f f f f f f f f f f

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Abstract Statement of the Production ef, and	Trade in, Saw	Cotton/or the year	ending 31st March 1889.
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a	Presidencies, Provinces, and Native States that produce the Indian Cotton.	Referen- ces to pages where fuller details occur.	I. Population (including ports).	II. Area under Cotton in	III. Outturn of cleaned Cotton in	IV, Total Imports.	V. Total Exports.	VI. Net Ex- ports or Net Im- ports, drawn from pro- duction.	VII. Amount available for local consump- tion, work- ed out from VI., HI.,orV.
1	1. Bombay Presidency and Native States (ex- eluding Bombay Port).	60	13,267,400	Acres. 5,198,400	Cwts. 3.563,700	Cwts. 457.470]	Cwts. 3,427,184	Cwts. 2,969,714	Cwts. 593,986
	2. Sind (excluding Karáchi) 3. Berar 4. Rajputana and Central India 5. Madras (excluding Ports) 6. North-We6t Provinces and Oudh 7. Panjáb 8. Central Provinces 9. Nizám's Dominions 10. Bengal 11. Assam 12. Mysore 13. Burma (Lower) Provincial Totals Outturn according to Mr. Beaufort	84 87 97 99 109 117 128 132 133 139 147 148 	2,413,800 2,672,673 19 > 59 (29) 28,871,376 43,268,599 i8,799.3 >9 9,838,791 9,845,594 69,586,861 4,932,046 4,186,188 66/3 •771	96,400 1,091,551 •886,419 1,794,510 1,399,388, 759,465 613,348 •1,016,565 f 162,000 40,588 29,814 10,191 13,998,639 	189,600 1,276,061 •877,607 801,120 706,344 931,824 351,923 •307.002 fi39,000 54,359 11,459 -9,494 9,219,493 9,625,000	77,079 8,704 3,780 98,039 122,006 1,889 8,756 687 119,755 3,671 3,159 55,295 960,290	$\begin{array}{r} 224,957\\ i,333.i86\\ 500,411\\ 592,865\\ 825,734\\ 295,976\\ 170,130\\ 82,529\\ 123.317\\ 29,435\\ 1,120\\ \hline \\ 7.755,741\end{array}$	147,878 1,324,482 596,631, 494,826 703,728 294,087 i6i,374 81,842 3,562 25,764 2,039 6,812,325	48,448 280,976 309,343 2,616 637,737 190,549 225,160 135*438 28,593 13,498 15,892
		15. Kará	Chief Po chi ditto tta ditto as Ports	orts.	•••	6,002,539 268,552 690,722 620,734	269,039 403,740		+ 1,617,104
		277 17 1 00		· Port Town T	otals	7.582,547	5.730,454		1,852,093
	Total Foreign Transactions (Im	ports of	Foreign Cotton	; Exports of	f Indian) .	64,627	5,331.904		
	Total Indian Trade (Imports by the l	Port Town	ns and Exports	to the Provi	nces)	7,517,920	398,550		l

• Averages of several years, not actual returns for 1888-89. t Estimate made in the year 1878.

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Commercial Forms of Indian Cotton. (Watt & Murray.) GOSSYPIUM.

Below will be found brief accounts of cotton cultivation in each province, the attempt having been made to bring together all available information. In the case of provinces possessing port towns, the provincial transactions have, as far as possible, been kept distinct, so that production might not be confused with markets of supply from which the foreign exports take place. With reference to the port towns, the areas from which supplies are drawn have been exhibited, so that it is possible to judge approximately what provincial cotton goes to each special foreign market; but before proceeding with provincial cultivation it may be as well to say something of:—.

THE COMMERCIAL FORMS OF INDIAN COTTON.

The Indian cotton of commerce is divided into certain well-defined forms, designated according to the localities in which each is chiefly cultivated, and distinguished by certain peculiarities of staple. For an account of the botanickl nature of these forms the reader is referred to the descriptions of the various species in the chapters on Botany (pp. i-39), also to the provincial accounts, in which it has been attempted, as far as possible, with the limited material available, to refer each to its proper botanical position. It is. however, almost impossible to give accurate botanical definitions of these Though the commercial terms may at one time have signified speforms. cial forms of cotton in addition to the port of shipment or the place of production, in the present day they merely denote different standards of quality irrespective of race. Thus Mr. Ozanne, Director of Land Records and Agriculture, Bombay, in a note kindly furnished to the editor, writes, " A bale of cotton classed under any of these standards may contain the produce of different races, provided the staples blend together and are not easily detected. Thus the newly-created standard ' belati⁹ (see Oomras) has been found to contain staples of four distinct kinds, in certain proportions, which often determine the place of a mixture under a standard and consequently its price.*'

In this paragraph a short description of the area under each form (as recognised commercially), the progress made in its cultivation, and the pSrts supplied, will be attempted, but the authors are indebted for much of the information given regarding area, locality, &c, of the commercial growths of cotton, to Mr. Beaufort's valuable compilation of Indian cotton statistics • they have also to acknowledge useful information received from Mr. Ozanne'

"Dholleras."—Is a race of cotton (called after Dhollera, till lately, the chief port of shipment on the Gulf of Cambay), the cultivation of which has of recent years, shown a very marked expansion. It is principally produced in the Native States of Kathiawar, and includes the produce of the two annual varieties *lalia* and *vagadia*[%] and the two perennials *jeria*, and *Yogi*. Mr. Beaufort writes :—'' Excluding the State of Baroda, a portion of which till 1885-86 was not included in the Kathiawar Native States, the acreage has risen from a mean of 1,408,000, acres to 1,996,000 acres/ In the Baroda State, in the last four seasons, it has averaged 168,000 acres, making a total average area devoted to this 'growth ' of 2.547,000 acres. Of this, 1,760,000 acres are in Kathiawar, 360,000 in Ahmedabad, 1,790 in Cutch, 168,000, as stated, in Baroda (districts of Kadi and Amreli), 70, ^00 in Palanpur, and the remaining 14,000 acres in Kaira, Mahi Kant ha, and Cambay." In 1888-89 the acreage was somewhat lower than the average above cited, vi*., 2,469.000 acres. Mr. Ozanne informs us that Dholleras are now sold in Europe under the names of Bhownagtrer Mcwa, Wadwhair, Veerumgaum, and Veraval Cutch. The land is "pre^ pared for this crop in May to June, the seed is sown in June, and picking takes place from February to April, or March to May. The average oun turn is 1,600,000 cwt. of cleaned cotton, of which the average receipts in Bombay are 1,407,000 cwt.

CULTIVA-TION. Areaft Outturn.

COMMERCIAL FORMS. 72

Dholleras*

73 Conf. with pp. 27, 62—63.

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Commercial Forms of Indian Cotton.

COMMERCIAL FORMS. Bengals. 74 Conf. with **Pp. 7—14;** 96—99; 109-114; 118-16; 134-135. **Oomras.** 75 Conf. with pp.62, 68; 88—92. Westerns. 76 pp. 101—104; 132. Conf. with

"Bengals,"—| race of cotton grown chiefly in the PanjAb, the North-West Provinces and Oudh, Bengal, Rajputana, and Central India. The area under the crop is the largest returned for any • growth ' of cotton, the average during the past five years having been 3,492,000 acres, y,* this the Panjab grew 860,0c0, the North-West Provinces 1,536,000, Oudn 79,600, Bengal 162,000, and Rajputana and Central India 840,000 acres. The land is prepared in May-June, the seed is sown in June, picking takes place from October to January, and the average yield from the total area is said to be 2,730,000 cwt. "Bengals" from the 'Panjab go to Karachi, Calcutta, and Bombay for shipment; those from the North-West Frovinces and Oudh to Calcutta and Bombay; those from Bengal to Calcutta : and thos: from Rajputana and Central India to Bombay.

cutta ; and thos: from Rajputana and Central India to Bombay. ^{kt} Oomras'' or '' Oomra-wuttee cotton.''—\s divided in Liverpool into three separate growths—Oomras, Khan desk, and Bilatee*} but in the-3ombay market the names of the principal producing districts or provinces are the leading heads under which statistics are compiled. '' Khandtsh '' is produced in the district of that name, also to a small extent in Nassik* The area under the crop in these districts during the past five years averaged 887,400 acres. '' Barsee'' and '' Naggar'' are named after the towns of Barsee and Ahmednaggar, through which the bulk of the cottjin passes, but, according to Mr. Beaufort, the greater portion is actually grown in the Nizam's Territory. The area in the Bombay districts during the past five years averaged 63,600 acres. According to Mr. Ozanne, three forms of cotton are sold under the name of Oomras :--''^a good-stapled form, Akola; a medium staple from Indore and Oojafti, J^{af}* gaum and Dhalia, and third, the short-stapled Bilatee* from Khandeshana Oomrawatti, Shegaum, and Akote. It is practically, however, a mixture of four distinct kinds, banni, jarivaradt; acclimatised American, and the ordinary variety of the Deccan. But Oomras proper is banni and jari ^{oV}^'

ordinary variety of the Deccan. But *Oomras* proper is *banni* and *jari* ${}^{0V_{\Lambda}}$ ' The finest description of ${}^{-1}$ *Oomras*" is produced in the Berars, but the xrea under the crop in that province has shown a decided faliing-off at least during the past twenty years. Thus, in 1878-79, as much as 2,207,889 acres were planted with it, while the average for the past five years has only reached 1,957,200 acres. It is grown in all the districts, the average in each for the same period having been—Amraoti 4.80,000 acres, Akola 479,000 acres, Buldana 300,000 acres, Wun 231,000 acres, Bassein 233,000 acres, and Ellichpur 231,000 acres, making a total of nearly 1,960,000 acres. The total average area under " *Oomras*" for all India, during the past five years, was, as shown above, about 2,910,000 acres. The average crop for the same period was 2,007,000 cwt., of which 1,836,000 cwt. was sent to Bombay for shipment, the rest being retained for local consumption.

The land is prepared for the "*Oomras*" crop in May-June, the seed is sown in June, and picking is carried on from November to March.

•' Westerns''—This race, as its name implies, is one of the chief cottons of Madras, the Nizam's Dominions, and Western India generally. Iⁿ the Madras Presidency, Bellary is the principal district, with 250,000 acres, followed by Kurnul with 205,000, Anantapore with 110,000, and Cadapp^{an} with 100,000 acres, making a total of 665,000 acres. The avenge area under the crop during the three years preceding 1887-88 in the Nizam's Dominions was 973,600 acres, and in Sholapore (Bombay) 25,000, making an average grand total under •' Westerns'' in India, of about 1,660,000 acres. The average outturn for the past five years was 735,000 cwt., of which 112,000 cwt. was sent to Bombay for shipment, the bulk of the remain-

^{*} yUayati-Khandesh or Varadi. This while not. strictly speaking, a commercial form, is now so largely employed for adulteration that it may be viewed as of commercial importance. Conf. with pp. 62, 75,89—91.

Commercial Forms of Indian Cotton. (Watt & Murray,) GOSSYPIUM

der going to Madras sea-ports. The land is prepared for the crop in July-COMMERCIAL FORMS. August, the seed is sown in August-September, and the picking, which commences in March-April, is completed by May or early in June. " Dharivars."—This is an important Bombay cotton, grown principally **Dharwars.** in Dharwar, Bijapore, and the other Southern Mahratta States. The aver-77 age area covered by the crop during the last three years was 277,300 acres, Conf. with of which Dharwar contributed 191,000, Bijapore 25,000, and the remaining pp. 17—185 62—63; 67. Southern Mahratta States, 61,000 acres. The average yield for the same period was 122,000 cwt., of which the greater part went for shipment to Bombay. Dharwar cotton proper is the produce of the American or New Orleans variety, introduced into these districts about half a century ago. The periods of sowing and picking correspond with those of •• Westerns. 'Coomptas.''-This is another Bombay cotton of some importance, grown Coomptas. **78** Conf. with pp. 62; 68. under the same conditions and in the same seasons as *Dharwars*. During the past three years the average acreage was 968,300, a considerable diminution on the figures for the four years ending 1883-84, in which the average was 1,118,250 acres. Bijapore, with 347,000 acres, is the chief district of its cultivation, followed by Dharwar with 287,000 Belgaum with 172,000, Kolhapur with 31,000, and the remaining Southern Mahratta States with 132,000 acres. The average outturn for the same period was 420,000 cwt., of which the great bulk went to Bombay for shipment. It is supposed to be the native race of the Bombay Karnatak, and is named after one of the principal ports from which cotton of that district used to be shipped. In Kanarese (th6 prevailing language of the country) it is called $i < ivdri-hatti=s^*$ country cotton," to distinguish it from the acclimatised American form. Broach. "Broach."—This is the cotton of Baroda, Broach, and Surat. The total 79 area taken up by the crop in the four years ending 1888-89, was 597*000 acres, of which Broach contributed 241,000, Baroda 227,000, and Surat Conf. with pp. 62-63. 129,000 acres. The average outturn for the same years was 525,000 cwt., of which 133,000 cwt. was despatched to Bombay for export. Breach cotton consists for the most part of the lalia form, and is locally known as kahnam, i.e., "black soil " cotton, to distinguish it from the rogi perennial cotton of the light soils of Gujarat. As in the case of most of the other Bombay cottons, sowing is conducted in June, the picking commencing in February and finishing in April. " Coconadas."—A red cotton, principally produced in the Kistna district Coconadas. of Madras, where on an average about 200,000 acres are taken up by it. 80 Nellore also contains about 25,000 acres under the crop, and Godaveri 20,000, making a total of 245,000 acres. The average crop is about 80,500 Conf. with pp.27; 101 cwt., of which nearly the whole is sent to Guntoor to be press(d, and is de-ĪŌ2. spatched from thence chiefly to Coconada for export. A small quantity, however, is transported by the Buckingham Canal to Madras. This, like the other Madras cottons, is grown during the north-east monsoon, being sown in September-October, and picked in February to June. Tinnevellys. "Ttnnevellys."—Are entirely shipped from Tuticorin, from whence 81 nearly the whole is despatched coastwise to Bombay for transhipment to Conf. with jpo; Js in Europe. The average area is estimated by Mr. Beaufort at pp. ioi-102. 742,000 acres, distributed as follows :- Tinnevelly, 320,000; Coimbatore, 250,000; Madura, 120,000; Trichinopoly, 26,000; Salem, 17,000; South Arcot, 6,000; and Tanjore, 3,000 acres. The annual average crop is about 450,000 cwt. It is the latest of the cottons, being sown in Octo-Salems. ber-November, and picked from March to April.

In passing, it maybe remarked that the cotton known as ^{IC} Salems" or *• Coimbatores " of older trade returns, was a race grown from Bourbon seed, which was at one time cultivated to some extent in Coimbatore and

Salems. 82 Conf. with pp. 19; 102GOSSYPIU VI.

Commercial Forms of Indian Cotton.

COMMERCIAL	Salem, and found a ready sale in China. Of late years, however, the stock
FORMS.	has greatly deteriorated, and, according to Mr. Beaufort, the variety has,
TTI	so far as export trade is concerned, virtually ceased to exist.
Hlnganghat.	" <i>Hingawrhdt</i> "—A race of cotton peculiar to the Central Provinces,
	named after the town Hinganghat. The cultivation of this cotton appears
Conf. with p. 129.	to have greatly fallen off during the last fifteen years. Thus, in the four years ending 1878-79, the area averaged 800,200 acres, while, in the
p. 129.	last five, it has amounted to only 608,800 acres, probably owing to other
	crops, such as wheat and linseed, having proved more remunerative. Mr-
Į	Beaufort gives the following distribution of the area of cultivation at the
	present time: " Of the four divisions, into which this province is divided for
	administrative purposes, the Na^pore one produces most cotton, more
	than half of the total area being in this division. Nearly a third or, sayt
1	220,000 acres, is in the Wardha district, while the Nagpore district hf-s an
	average over 120,000 acres, and Chanda about 20,000 acres. In the Ner - budda division the districts of Newar and Chindwdrd, have each about
	45,000 acres under cotton, Narsinghpur about 30,000, Raipur. Bilaspur, and
	Sambulpur, in the Chhatisgarh division, together devote about 55,000 acres
Slnd.	Sambulpur, in the Chhatisgarh division, together devote about 55,000 acres annually, the remaining 75,000 acres being cultivated in Saugor, Jubbul-
84 .	pur, and Damoh of the Jubbulpur division."
04 . Conf. with	The average crop is estimated at 226,000 cwt., of which the greater
p. 85.	part appears to be retained for local consumption, or transported byroad,
F	rail or river to some other province, only 42,000 cwt. being sent to Bombay for purposes of export.
	<i>Hinganghdt</i> is one of the earliest of all cottons to come into the
Assam	market, being sown in May-June and picked from November to March.
85 Conf. with	^M Sind."—Cotton cultivation in Sind has shown a steady increase during
pp. 7, 141—	the past twenty years—the average annual area having risen from $57 \times 9^{\circ\circ}$
142.	acres in the decade ending 18/9-80, to 73,000 acres in the past five years.
CULTIVATION	1 ITyderabad, with an average area of 55,000 acres, is the principal produc-
BOMBAY.	ing district. The average crop for the past five years was 105,000 cwt., of which the greater part was transported to Karachi for shipment.
86	The crop resembles most other north-west monsoon cottons in its season of
Key to Pro- vinces.	growth, being sown in June-July and picked in November to January.
Bom.pp. 60 to	
84. Sind pp.	acres, on which the outturn is calculated to be as high as 150% per
84—86. Berai pp. 86 <u>—</u> 96.	dere. The average crop is estimated at 55 100 ewe, of which the greater
Baj. Maad. pp	portion is transported by river to Calcutta for export.
99—109. N.	I. BOMBAY.
W.P.pp. 109 —117. Pan.	
pp. 117, 128.	106-107, 109,127,155-158, 161,167, 169; Walton, History 0/Cotton, 1850; Forbes, Gin Factory at Dharwar, r862-63; Rep. on Admn. of Cotton
CJ>.pp. 128-	- Dept., 1868-69, • Annual Repts., Bomb. Cotton Dept.; Cotton Repts., Agru
I ₃ 3. Hi: *s Damns, pp .	Dipt.; Rept.from Director of Land Records & Agri., 1889; Admn. Repts. in many passages; Gagetteers: II., 63, 178, 392-404, 411, 461 ; II*, 5*9
134-133.	75/ IV., 55; V., 106, 125, 241,294, 371; VII., 79,87,97 • VIII., if5'
Ben. pp. 133– 139. Assam	- i66, 248-253, 262; X., 150; XII., 153-162; XIII., 290; XVI., 101, 167;
\$\$\$\$\$\$\$\$\$\$\$\$\$	
Mysore pp. 14	J' = J'
—148. But. pp. 148-152.	REVIEW OF AREA, OUTTORN, AND CONSUMPTION OF COTTON. —III the
Andamans	I able p. 50, the area of cotton in bolinbay and its Native States during the
p. 152.	year ending 1888-89. ¹⁵ given as having been 5,198,400 acres. According to official returns, the Bombay cotton area during the past twelve years has
Area.	fluctuated slightly, while progressing forwards from 2,863,306' acres in
87	1877-78, to its present extent. The outturn has similarly shown a progress-
	sion : in 1884-85, it was 3,432,600 cwt.; in 1885-86, 4,166,900 cwt.; in
	G. 87

Cultivation of Bombay Cotton. {Watt & Mutray.) GOS	SYPIUM.
1000-07, 5, 67 5, 000 Cwt., III 1067-06.5, 227, 100 Cwt., and III 1060-07, 5.505.700	ULTIVATION BOMBAY. Yield. 88
believed to be very nearly correct. But the Presidency of Bombay imported and exported cotton from and to other provinces, and, at the same time, consigned large quantities to its port town, which were destined mainly for the foreign traffic from Bombay. The balance of all these transactions on outturn, resulted in a net surplus remaining in the presidency of 593,986 cwt.—the amount available for local consumption. Similarly, all transactions to and from the port town showed a net balance for the local market (chiefly the power-mills) of 1,617,104 cwt. The total balance left in Bombay Presidency and its port town, therefore, amounted to 2,211,090 cwt. It must be here urged that the error due to the overlapping of outturn and traffic for the months of April May, and June of any action score	Conf. with p. 161.
and traffic for the months of April, May, and June, of any cotton season with the official statistics of trade of the year ending 31st March, is a con- stant factor which prevents actual comparison between commercial and official statistics. But in dealing with the possible sources of error in Bombay cotton statistics, the Director of Land Records and Agriculture drew attention in 1889 to an even still more serious error :—« It must be noted, that in the estimates of outturn, the produce of over 100,000 acres, representing the area of unsurveyed villages, is not taken into account. If the produce of this unsurveyed area be added, the estimated outturn will leave a considerable margin, for the excess demand of the well-to-do classes and other miscellaneous uses, after meeting the full demand for local consumption."	P. Yor
In Bombay there are working, at the present moment, 55 mills in the island, and up-country 21, The former consumed, during the year ending 30th June, 1,973*055 cwt., and the latter 363,888 cwt. The total of these figures would give a greater consumption, were the official and commercial figures to be arbitrarily compared, than the available balance shown above, The imperfection of road statistics has, in most provinces, however, a serious influence. Thus large quantities are carried by road, across provincial frontiers, to collecting centres, particularly near the railways, and these appear in statistics of rail-borne trade without having been shown as exports from their actual areas of production. Thus, for example, large amounts of cotton from the Nizam's Dominions arrive at Sholapur and	consumption 89
Ahmednagar by road, and are then conveyed by rail to Bombay. The totals of the entire cotton transactions of India, however, when earned over a number of years, so completely agree with production and trade, as to justify the inference that while errors exist in this province, and that, more serious in one case than in another, the figures herp given may be accepted as fairly correct. This recommendation of accuracy would appear more \$sp£riafly applicable to Bombay, since the relation of area, outturn, and yield, bears a close approximation to all available statistics of the sales and movements of cotton to and from the presidency. In a recent official correspondence regarding the cotton trade of Bombay and its Native States, it has been estimated that 20.000 cwt. are con	

bay and its Native States, it has been estimated that 20.000 cwt. are con-sumed for wicks, about 80,000 cwt. for beds and cushions, and about 619,400 cwt. for cloth of local manufacture, thus making a total of 719,000 cwt. Were a similar statement to that in the table, p. 56, to be worked but

G. 89

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Area, Outturn, and Consumption of

CULTIVATION for the past five years instead of one, the annual average left for local conin BOMBAY. sumption in the presidency (excluding its port) would be found to have been 702,200 cwt. As already remarked, the up-country mills in Bombay Presidency consumed, in the year 18258-89 (ending 30th June), 363,888 cwt., and their annual average for the past five years, is found to have been 310,780 cwt. Deducting that amount from the total estimated annual average we learn that the Bombay Presidency, excluding its mills, consumes 387,42° cwt. a year. By a careful comparison, of outturn and total estimated consumption, of Bombay-grown cotton, the Director of Land Records and Agriculture has arrived at the conclusion that the average consumption ot purely local cotton, per head of population, is 3*62fl), which, on the assumption of its all being made into cloth of the Bombay texture and weight (^{vit} 4j yards to the pound of cotton), would be equal to 15 yards. This would allow for loss on manufacture, but deducting the equivalent for consumption of cotton in minor usages, an average of 13 yards is arrived at a? probably moT5 nearly the correct consumption. On this further factor the Bombay statistics may again be confirmed : hence it may in fact be safely said that about four parts are exported, and one part remains to meet the local consumption. Chief These are indicated by the following figures for the year 1888-89 :---Districts. 90

						Chief Races gtown.	Average acreage.	Outturn.
Khandesh Dharwar Bijapur Ahmedabad Broach Belgauro Surat . Ahmednagar	•	• • • • •	• • • • •	• • • • • •	• • • •	Oomra watte e Dharwar Kumta Coompta (Kumta) D holler a Broach Coompta (Kumta) Broach Oomrawattee	921,202 475,952 336,160 327,238 259» 4 9 146,687 89,626 23,862	Cwt. 5*94*9 156,333 116,293 278,56' 194,183 77,406 57,040 1,562

In the other districts of Bombay proper, the cotton area is very small. The following passages, extracted from the *Gazetteers*, give particulars regarding the cotton grown in the more important of the above regions. While not an exhaustive selection, it is believed the facts narrated in these passages convey the main features of the growths or races of Gossypi^{«m} met with in Bombay.

Speaking of the cotton grown in Khåndesh, for example, it is stated that, in 1878-79, there was a tillage area under *kapds* of 590,703 ^{a. cres}; Cotton was even then regarded as the chief crop in Khåndesh. The local form, known as *varhddi* or *berdr*,* was thought to have come to the district through Málwa. The author of the *Gazetteer* says: "It is short-stapled, harsh, and brittle, and has lately been largely supplanted by two foreign varieties—Hinganghát of two kinds, *banni* and *jen*; from the Central Proyinces, and Dharwar or acclimatised New Orleans, from Dharwár." *J a **footmote**, the *banni* is said to bboan earlitter are the *jeri*, a later form (coming into the unarket a mouth or six yeeks later), is whiter and freer from leaf, but has a poorer staple. TV: wn-er goes on to say that the Dharwar is slightly longer in staple but much weaker than the Hinganghát, which, if well picked and cleaned, fetches a higher price. Dharwar cotton, with larger and fewer pods, is the more easily picked. Being close-podded it can also be picked cleaner than Hinganghát, but from its larger and more clinging seeds, it is more apt to_bg

^{*} Conf with Valayati-Khandesh, pp. 58, 75.

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	Bombay Cotton.	(Watt & Murray.)	GOSSYPIUM.

stained in ginning. Of Dha'Wa'r, it is remarked, there are three kinds of in BOMBAY. cotton grown, viz., Gossypium arboreum, dev kdpas (God's Cotton), used in making sacred threads and temple lamp wicks; G. indicum, jvari-hatti, that is, country cotton ; and G. barbadense, vildyati-hatti or American cotton. Of these three forms, G. arboreum, a perennial bush, 8 to 12 feet high, is grown occasionally all over the district-in gardens, beside wells and streams, and near temples. " It is much like the Brazilian or Peruvian cotton plant, and, though this is unlikely, it is often said to be an American exotic." The jvdri-hatti, generally known in the Bombay market as kumta (Coompta) coiton, is largely planted all over the black-soil The vildyati-hatti, commonly known as SAW-GINNED DHARWAR, plain. which was introduced by the Government in 1842, has thriven well and has come to occupy about a quarter of the district cotton area. Among thejxrtton-producing districts of the Bombay Karnatak, Dhá>wár stands first, and both its American and its local cotton are highly esteemed. All evidence goes to show that with fair treatment in preparing them for the market, the two varieties grown in DhaYwa*r will rank among the best cottons of India. In Bijapur, the same forms of cotton appear to be grown as described above in DhaYwaY.

Of Broach, it is remarked, there are two forms of cotton—the annual of black soils, *Idlia*, and the triennial of light soils, *jdria*. These are the chief forms, but, according to the Gazetteer, two others are less fre-quently met with, viz., roji and nurtna. The latter appears to be Gossypium arboreum, which will be found described in various passages throughout this article, more particularly at pages 5-15. The roji is an inferior cotton, grown mainly in Baroda ferritory and brought into Broach district, chiefly with the object of being mixed with the regular Broach cottons. Of Ahmedabad, it is remarked that no foreign cotton is grown. " The local varieties are, in the Viramgaum sub-division, jatvaria ; in Dholka, bhdlia and vagadia 5 in Dhandhuka, Idlia and vagadia; and, in small quantities near the city of Ahmedabad, jaria. Except *idxfa* these, are all varieties. The *jdria* is allowed to grow for four seasons.' The *jdria* is grown along with millets; the other kinds are never treated as mixed crops. The vagadia is a hard-shelled cotton, which must be picked with the pods, the other kinds ought, in picking, to be separated from the pods. But this is nowhere the practice, and, in consequence, the shell, broken and mixed with the wool, greatly lowers its value. Mr. Ozanne informs the writers, in a recent note, kindly furnished on the subject, that the Sanitary Commissioner attributes the high death rate at Viramgaum and other places where the *vagadia* is cleaned by hand, to the diseases which result from the practice.

The Native State of Kathiawar is a most important producing area in the cotton supply of Bombay. Within the past few years, the area under the crop has been remarkably expanded, and the amount of Dhollera cotton brought to market accordingly greatly increased. Kathiawar, with Baroda, Ahmedabad, Cutch, Palanpur, Kaira, Mahi Kantha, and Cambay constitutes the region from which *Dhollera* cotton is derived, and during 1888-89, 2,547,000 acres were under that crop. In the Gazetteer of KatX'owar it is stated that two kinds of cotton are grown, viz., vdgria or dhdnknia, and pumadia or Idlia. Vdgria is almost solely grown in the north and east districts in Jháldvád and Dhandhuka, and Idlia throughout the rest of the province. The pod of the vdgria does not open when ripe so as to allow the seed-cotton to be picked. It only slightly bursts and continues to clasp the cotton tightly, so that the pod and all has to be picked. The *ptimadia*, when ripe, bursts open, and the cotton is easily picked from the pod as it hangs from the tree. The *vdgria* cotton, though Vagria OF vagadia cotton, 91

Cotton pod which does not open. 92

Chief Districts.

CULTIVATION in BOMBAY. Chief Districts. **Races of Bombay Cotton.**

inferior to i_{4} pan, by careful handling, be prepared so as to look very much like *pumadia* Vdgria has the advantage that the pods can be stored during the rains without injury.

Vdgria cotton stored and cleaned in December is called navlodh. It is whiter than *pumadia*, but, in other respects, poorer. The chief varieties of exported cotton are locally called after the division from which they come, as Hollar and Jhalavad. The best cotton comes from the Palitana State. The whole crop of Pálitána cotton is only about 2,100 tons, but it is by far the best prepared for the market, being well cleaned and free from adulteration. It is bulky, of a good bright creamy white with a yellowish tinge, and the staple is even, fine, and fairly strong and long. It classes from good to fine. The cotton grown in the Bhavnagar districts is called desdn. It closely resembles Politana but is not so well prepared and is occasionally damped to add to its weight, or is mixed with seed, especially when prices rise beyond the rales at which the cotton is usually sold. The Bhavnagar crop averages about 9,800 tons, and most of it classes m Bombay and Europe as good. With care it could easily be made as fine as Palitana. The cotton grown in Wadhwan, Limbdi, Halvad.Chuda, and Gujarvedi is known as vdgria Jhalavad, and is grown from a peculiar seed. When properly picked and cleaned, it is reckoned good cotton, being a bright white which does not readily fade. Its staple too is strong, fairly long, and even, and has much body and bulk. Spinners readily buy it to mix with other kinds of cotton which lack these qualities. It» seldom properly prepared, most of it being full of fine-powdered leaf, which, after a certain stage, it is almost impossible to remove.

Jatvad cotton, grown between Wadhwdn and Viramgaum, finds its way into the Kathiawar markets; it is of a very low quality. Mahuva cotton, grown chiefly in the Mahuva, Lilia, Amrefi, Kundla, and Talaja districts, closely resembles Pálitána cotton, and, like Pálitdna, classes as good and fine. What specially recommends it to buyers is its purity and cleanness. ". In Bh&l and the neighbouring district of Dhandhuka, a better cotton 1* known as *pumadia* or *Idlia*." "The bulk of the crop from these districts, as well as that from Limbdi, Ranpur, Borsad, Cambay, and Dholka, is marred by leaf and is known as sakalia. A weak, flimsy cotton finds its way into Kathiawar from these districts and is known in Bombay as sagar. It harsh, short-stapled, and of a dirty white, much like wool in appearance and touch, and mixed with salt and clay. It is known at once by J^{1s} smell. The cotton of Sorath and Hdlar is inferior to that grown in other parts of Kathiawar, and is known in Bombay and Europe by the names ot its place of export, Veraval and Mnngrol. It is soft and flimsy, of a bluish white, and though the staple is fairly long and silky, it is weak and much mixed with dark broken leaf and seed. Here, as elsewhere, except in Mahuva and Palitana, adulteration is common and most difficult to stop.

The above passages, taken almost at random from the *Gazetteers*, indicate the complex nature of the subject of the Bombay cottons. It seems probable that roost of the forms mentioned are local cultivated races that owe their peculiarities to selection and methods of cultivation, continued over many generations, if not centuries. For an account of the botany or the indigenous races oi Bombay cottons, the reader is referred to the special Chapter on that subject (pages 9, 12—14,17, 28.). It need be only here added that by far the most prevalent form is the plant now known as G. Wightianum. (Conf. with pp. 88, 129).

It is also perhaps needless in this place to allude to the forms of exotic cottons that have been tried in Bombay. The history of the experiments with exotic cottons will be found detailed below, and it is probably enough to add that two or three forms have assumed acclimatised, though degeRaces of Bombay Cotton. (Watt & Murray.) GOSSYPIUM.

CULTIVATION nerated. conditions. These are G. hirsutum, Roxb.—New Orleans cotton, in BOMBAY. for the most part called saw-ginned Dharwar cotton : G. acuminatum, Roxb.—the kidney-cotton, most generally met with in the presidency—and Conf. with G, peruvianum, *Čav.* The two last-mentioned exist mainly as garden crops; pp. 20, 22. they grow, for the most part, into trees, and have thus come to bear the vernacular names of G. arboreum, the floss indeed being used in the pre-Chief Districts. paration of the sacred Brahminical thread. To some extent, also, the remains of the cultivation of other exotic cottons exist, the Georgian, Sea Island, and other forms being occasionally met with in degenerated and neglected conditions. The difficulty that exists, in accounting for the special properties of each of the Indian races of cotton, or of establishing the causation of inferiority or superiority, must remain in the obscurity that involves many features of tha cotton industry, until definite experiments have been made with the view of ascertaining the features of each species botanically, and the taints of character, injurious or otherwise, that have passed into the races or hybrids now grown in the country. Such experiments, if conducted coincidently with chemical and meteorological investigations, would afford the key by which many obscure problems might be solved, and a tangible advancement made towards the improvement of the cotton supply. It would almost seem as if this much-to-be desired object had been retarded, through experiments at acclimatisation taking the place of selection and improvement of existing forms. The fact that so many races of cotton occur in one district, as have been mentioned above, in connection with Kathiawar, seems

to show that India need not be dependent on America for new and improved forms of cotton. These remarks are not, however, intended to throw doubt on the propriety of attempts at acclimatisation, but rather to deprecate the false impression that too frequently exists in India, *vis.*, that no other methods of improvement are open to the agricultural reformer.

CULTIVATION.-SOILS: ROTATION OF CROPS: PLOUGHING: IRRIGA-TION : &c-One of the earliest and, at the same time, one of the best derailed accounts of Bombay cotton is that written by Dr. Hove in 1787. Linschoten, and also Rheede, 200 years before ihe date of Hove's visit, briefly described the cottons of India. The former traveller made special mention of the muslins of Cambay and of Dacca, and of the cotton of Coromandel and the calicoes of various places in the Madras Presidency. The distinguished Polish traveller (Hove) came, however, to India for the express purpose of studying the cotton question, and his report is replete with interest. The botanical results of his study have already been briefly discussed under G. arboreum (to which the reader is referred, p. 12). Hove found, in Guzerat and other parts of Bombay, cotton cultivation relatively in as flourishing a condition as it is to-day. For miles and miles, as far as the eve could see, plantation after plantation of cotton stretched, across Cambay. On the lower-lying lands a form of G. herbaceum—the yellow-flowered cotton as he calls it —occurred, and on the higher sandy soils G. arboreum—the tree cotton with red flowers—was grown. One of the most striking features of Hove's account is the fact that G. herbaceum was apparently often grown on inundated land or even in brackish swamps. The fields were banked up to retain the rain-water, and wells were dug, in their vicinity, from which water was drawn by crude Persian wheels or leathern buckets elevated by bullocks. His description of the methods of well irrigation is, in fact, identically that pursued with other crops, though, at the present day, only rarely resorted to with cotton in Bombay. In 1789, it would thus appear, the cultivators regarded a high state of irrigation as an essential to successful cotton cultivation. Within the past few years this idea seems to have been returning to Bombay; but, for at least half a century, it has been Method. 93

Method.

Area, Outturn, and Consumption of

CULTIVATION the habit to grow cotton only on soils possessed of deep-seated moisture, in BOMBAY. or in districts subject to rain at the season necessary for cotton-growing. The degree of inundation, which Hove seems to have witnessed, is abundantly exemplified by his statement that with yellow cotton, rice was often grown between the lines of bushes, whereas, with the red cotton, bajra, juar, or gram were grown. The yellow cotton was sown, he remarks, in the end of the rains, so that it might not be destroyed by too great inundation. It consequently "ripens a month later than the red cotton, $g^{r} \mathfrak{L}^{w}$ " on the higher lands and having the advantage of the powerful dews, which refresh the pods and promote vegetation, the wool gets not only com-pacter and finer, but likewise produces a greater crop. But the higher grounds, on which cotton ripens in the cold season, are not without some advantages. The dews falling on the wool that discovers itself by the elasticity of the capsula bleaches it, by the assistance of the sun, and jcontributes, in some measure, to its fineness. But where they have not the conveniency of water to support it in the period when the pod begins to swell, the crop is but poor and inferior in quality to those that have either a succour by freshes or are situated lower where the rains may have more influence." The idea of the necessity of artificial irrigation at the time the fruit is forming, has, within the past few years, begun to be felt, and many writers hold that the defect of harshness complained of against Indian cotton as a whole, would be remedied by a return to the system of cultivation which prevailed in the last century, where water, if not obtainable naturally, was supplied freely by artificial means.

Dr. Hove gives an interesting account of the method of ploughing and sowing cotton, as witnessed by him at Gorga, where, he says, the produce was the finest. As soon as the rain ceased, they ploughed all the high lands in the following manner : " A man measures the lines out by walking at the distance of 10 yards before the plough, drawing a line by a hooked piece of wood that scratches the earth which the ploughman follows, ind indents a furrow at the depth of six inches by an iron cutter, which is in the shape of an elephant's tooth mounted into a solid piece of wood. The car at the bottom is hollowed on both sides into a beading by which the furrow is widened, and the earth both pressed on the sides and prevented from falling back and filling it. The beam the oxen or buffaloes are fastened to, may be placed agreeably to their size, and the reins are passed through a hole in the upper part of the plough tail. The plough is so light, the cattle so well trained, and the earth so very brittle and mild, that it is more a play-work than labour, both to the farmer and cattle. " They do not cover the seeds but leave it to the first shower of rain which fills the furrows with the turned out earth, and the plantation is as level as a table.'

In the Bombay Gaeetteers and Agricultural Department Annual *Reports* much valuable information will be found regarding the method of cultivation pursued at the present day. The limited space at our disposal prevents us from even reviewing all the available information, but the following passages, selected under certain important sectional headings, will be found to exhibit the main features of this important branch of **Bombay agriculture.**

In the Khandesh Gazetteer it is stated that "cotton grows both in black and light soil. It is seldom sown in the same field oftener than once in three years, the intermediate crops being wheat and millet. With a moderate rainfall the black-soil crop, and with a heavy rain-fall the lightsoil crop, is the better, There is no special ploughing of the field for cotton. After the first or second rainfall, the heavy hoe, vakhar, is passed over the field to loosen and clean it. Manure is seldom laid down imme**Bombay** Cotton.

(Watt & Murray.) **GOSSYPIUM.**

diately before sowing, as the natives hold that it should be in the ground a year before the seed is sown." In the account of the Bijapur district it	In
is stated, that "No crop takes more out of the soil than cotton. It never thrives in the same field for two successive years, but must be rotated with Indian millet, wheat, or gram. The cotton fields are enriched with the ordinary manure. Fresh manure is believed to heat the soil and, therefore, applied to the land the year before the cotton is sown. Prior to sowing partly by the hand and partly with the hoe, the field is cleared of the stumps of the previous crop, and if the field is overgrown with the <i>karige</i> grass, it is ploughed with the larger plough or <i>neglai</i> .	BOMBAY. Method.
After the ground is cleared, the clods are broken by a heavy wooden beam. In the latter part of August the land becomes fit for sowing.	
The seeds are rubbed in fresh bullock dung and water, and are then dropped through the hollow tubes of the seed drill or <i>kurgi</i> . The seed	
drill is immediately followed by the hoe which closes the drills. The seed leaves show in six to eight days, and in about a month the plants are	
three or four inches high. The farmer then works the grubber between the rows of seedlings, rooting out young weeds and grass, the surface is	
turned, and the soil is heaped at the roots of the young plants. Weeds are also removed by labourers with a sickle. The crop is ready for picking	
late in February or early in March. A good crop yields five and some- times six, pickings; a poor crop not more than three or four." Of	
Ahmedabad it is said that " of the three varieties of soil, mixed, <i>besar</i> , is the best, black, <i>kali</i> , the next, and <i>light</i> , <i>gorddu</i> , the least suited to the growth	
of cotton." *' Manure is used in light, but not in mixed, soils. Even in light soils it improves the crop only after a good rainfall. In July, when	
the land is ready, the seed cleaned by rubbing with earth and ashes in a crude frame, is, at the rate of ten pounds the acre, sown from a drill-	
plough with three or four tubes or feeders. The watering of cotton, common a hundred years ago (December 1787), but apparently in 1850 gone out, of	
use, has again come into practice in Viramgam Hholka, and Dhundhuka. Watering much increases the outturn, but is open to *he objection that it	
makes the crop more apt to take harm from frost. When full grown the plants stand from 3J to 5 feet high. Fields sown in July, flower in Sep-	
tember and October, and pod in December. In light soil, before the time of flowering, cloudy weather, or even slight rain, though it somewhat keeps	
back the picking, does good. Much rain increases the size of the seed and lessens the outturn; and after the pods are formed and when near	
bursting, rain harms the crop." In the <i>Dhdrwdr Gazetteer</i> an interesting account is given of acclima- tised American cotton, from which the following passage may be given	
regarding the soil and climate of the district: "The upland plain of	
Dhárwár enjoys the unusual advantage of two rainy seasons, the south- west between June and October, and the north-east or Madras between	
October and December. The north-east rains give the country a fresh supply of moisture in October, and often again in November, and a small	
degree still later on. This moisture, with the cool November nights, has had a large share in successfully acclimatising New Orleans cotton. In the Deformation of the property resident response from 25 to 20	
the Dha'>wa'> cotton plains, the yearly rainfall ranges from 25 to 30 inches. During the cotton-growing months, that is, from September to Each way the returns for the first recent of 1882, show a supertext heat	
February, the returns for the five years ending 1882, show a greatest heat of 97° in February, and a least heat of 58° in December. For cotton to	
thrive, the soil should be loose and open enough to allow the air and sun to pass below the surface, and still more to let excessive and untimely rain drain from the roots. These qualities the anympling gaping soil of	

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drain from the roots. These qualities the crumbling gaping soil of Dharwir has in an unusual degree. The Dhdrwdr husbandmen describe

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Area, Outturn, and Consamption of

CULTIVATION their cotton lands as of two kinds: *huluk-yeri*, which is a mixture of black and red soil, and y*>ri₉ pure black soil. Both local and American cottons BOMBAY. are planted in both thebe soils, but huluk-yeri, or black and red, is gene-Method. ally considered best for New Orleans cotton, and yeri or pure black for local cotton. The black and Ted is considered the richer of the two, but in a bad season, blight and other diseases show themselves sooner, and ta a greater extent, in black and red than in pure black. The great ment of these two soils is the surprising length of time during which the undersoil keeps moist. It is this underground dampness that enables the cotton plant, especially the American form, to mature as late as March and April. When the surface of the field is baked and gaping with the heat the cotton bushes are still green, because their tap-roots are down in the cool moist under-soil. Cotton is seldom grown in red soil; the outturn is too small to pay at ordinary prices." In a foot-note to the above passage^thet chemical analysis of the Dhárwár cotton soil is given as follows:—"An analysis of the best cotton soil showed in 4,500 grains 3,324 grains of very fine soil, 936 grains of impalpable powder, and 240 grains of coarse pebbles like jasper, with pieces, like burnt tiles, strongly retentive of moisture* The impalpable portion consisted of 18000 grains of water, 0*450 of organic matter, 0.083 of chloride of sodium, 0.007 of sulphate of lime, 0'027 of phosphate of lime, 0'0450 of carbonate of lime, 0'013 of carbonate of magnesia, 15'200 of peroxide of iron, 16'500 of alumina, 0'085 of potash,48*000 of silica combined and free as sand, and 1*185 loss; total 100'000."

Seasons.

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SEASONS OF SOWIKG AND PICKING BOMBAY COTTONS.—The *Oomraivuttee, Dh oiler a, and Broach* growths are sown in June, the land having been prepared during May-June. The first pickings commence in December and continue till April and May.

The *Oomrawuttee* is the earliest in maturing, the pickings being complete in March. This is followed by the *Dhollera*, the pickings of which commence in February and are completed in April. The *Broach* begins to yield in March, the harvest being finished in May. It will thus be seen that a large portion of the Bombay cottons grown on the acreage of one year's statistics are included in the trade returns of the following-year owing to the official year ending 31st March.

The *Coompta and Dharwar* are much later still. The land is prepared in July and August, the seed sown in August, the first pickings made in March, and the crop completely gathered in May. The whole of the yield of this class of cotton, from the area of one year's returns* therefore, appears in the trade transactions of the succeeding year.

appears in the trade transactions of the succeeding year. Of Ahmedabad it is stated, that "beginning in early years in January_r but oftener in February, the picking season lasts till the end of March and sometimes till April. Except the Dhandhuka *vågadia* or hard-shelled cotton, which must be picked with the pods, the other kinds ought, in picking* to be separated from the pod. But this is nowhere the practice and, in consequence, the shell, broken and mixed with the wool, greatly lowers its value. The one-year plant yields two and, sometimes, three picking^, the three-year plant always three. The picked cotton is gathered in heaps and at the end of the day carried to the yard near the cultivator's house. Here the pods are broken and the wool drawn out by the hand_r and, to loosen and free it from leaf, it is laid on a rope framework or on the ground, and beaten with sticks." In the *Broach Gazetteer* it is remarked : "The time when a crop of cotton harvest is early, after a heavy fall it is late. If the rainfall has been light, picking begins about the 20th of December, and is over by the 10th of February. If the rainfall **G. 94**

(Watt & Murray.) GOSSYPIUM.

has been heavy, the pods do not burst till the middle of February, and CULTIVATION the cotton is not all housed till the last week in April. In an average BOMBAY, season the picking begins about the close of January and ends in March. Seasons. Before all the cotton is secured, the field has generally been thrice picked, with a fortnight's interval between each picking. The average proportion in weight of seed {kapdsfia}, to cleaned cotton (rut) is one-third of cleaned •cofton to two-thirds of seed." *' Before the time 'of picking-, some of the cotton grows over-ripe, and, falling to the ground, takes up dust and leaf. In this way a portion of the cotton is damaged before it leaves the growers' hands. But the intentional mixture of dirt and earth to add weight to the cotton is not the work of the cultivator but of the dealer, wabhdrio. Cleaned cotton is divided into two classes, the better, *tumel*, and the inferior, *rdsi*, or poor." » COST OF CULTIVATION AND PROFIT.-The estimated cost of cultiva- Cost ft Profit. 95

tion per acre on an average field in a good season is stated in the Khandesh	
<i>Gazetteer</i> (1880) to be as follows for two of the chief cotton-producing dis-	
tricts :	
Khandesh. Broach.	
Khandesh. Broach.	

Labour								£ s, d. o -g 'O	£ s. d. © u ©	
Manure	•	•	•	-	•	-	se	ldom used.		
Seed •	•	•	•	•	. •	•	•	0 0 7	o o 4*	
Rental		•			· •			0 2 0	o 6 O	
								description and the second		
					тот	TAL	•	o 11 7	o 18 4	

In the former district (with the prices then current) the cultivation left a net profit of 145. Sd. an acre, in the latter 16s. $j^{A}d$.

In the Gazetteer for Dhárvtár it is stated (page 28\$) that "the cost of growing cotton is difficult to determine. Much depends on the grower, the number of cattle he owns, the area of land he holds, the number of persons in his house, and many other conditions which more or less affect his actual cash outlay in growing cotton. Roughly, the acre cost of growing American and local cotton is Us. 4|rf. {R5-11-0}. As the value of the American crop may be set down at £1-105. (R15) and the value of the local crop at £1-45.-9^. (Ri2-6-0), the American leaves a net profit of 18*. l/d. (R9-5-0) and the local of 13\$. l/d. (R6-11-0). To the net profit on the country cotton a small amoint may be added, as in many cases the husbandman's family themselves clean the cotton."

In the *Khdndesh Gazetteer* it is stated that the cotton crop is usually mortgaged to the money-lender, who receives it in the raw or unginned state, and gives back to the cultivator such seed as he may want for feeding his cattle and for sowing. This system prevails more or less throughout the presidency. The local dealers get loans from the larger; buyers; from these they, in their turn, make advances to the growers, so that a state of indebtedness, dependent on the crop, prevails more or less in every grade of the cotton transactions.

MIXED CROP CULTIVATION.—On this subject In 1886-87 the Director of Land Records and Agriculture wrote as follows:—" Respecting the cultivation of cotton and the merit of the local expedient of intersowing occasional rows of *jovsari* or *tdr*, experiments made in the season under report prove that the cultivator, even in a good cotton season, secures a larger profit from the mixed sowings than from cotton alone, and that in a year unfavourable to cotton he ensures a fair return. But, on the other hand, the experiments do not show a similar merit in the local practice of ploughing up poor cotton and following with a late crop. It is better to Mitersow gram or linseed between the rows of poor cotton*" Many writers i

Conf. with prices, pp. 5° &51.

Vixed Crop. 96 GOSSYP1UM.

Diseases of

CULTIVATION allude in similar terms to these advantages as justifying the growing In tendency to extend the Cultivation of cotton as a mixed crop. The habit BOMBAY. is certainly less injurious to the cotton industry than the reckless admixture in the same field of two qualities of cotton by which means adultera-Mixed Crop. tion of good and bad qualities becomes unavoidable. It would seem, however, that even this pernicious practice is rarely a wilful action on the part of the cultivator, but is due, either intentionally or accidentally, to the buyer of the staple returning seed to the cultivator from a mixture obtained by ginning the cottons purchased from many growers. It would seem that this mixing of seed is only too frequently an intentional action, the dealer being thus saved the trouble of mixing bad cotton with good. SELECTION OF SEED.—Forbes Watson expressed the opinion that the Selection of seed from four and five-celled pods would produce a better yield and a. seed. better staple than that from the ordinary three-celled condition. Experi-97 ments have been made, at the Hyderabad Sind Farm, to test this theory, and the results of the trials may be seen by reference to the tables on p. 3 Whatever merit can be attached to the information therein tabulated there would appear to be no doubt that much greater success would be attendant on careful selection of seed than on experiments in acclimatising foreign prize varieties. If there be a demand for cheap cottons, as seems the case (both in India and Europe) care should be taken that the cultivation and trade in such staples be kept distinct from the good growths. The mixing of the seed of two qualities is not only direct adulteration but the surest way to secure, through hybridisation, the degeneration of the better stocks of Indian cotton. DISEASES TO WHICH BOMBAY COTTON IS LIABLE.—In DhárwSr it is Diseases. stated that the cotton crop is liable to two classes of disease. Benithgt 98 rog is brought on by continued hard, cutting, easterly winds. The leaves turn red and become blighted. The flowers and pods fall off without maturing and the plant slowly dies. *Karaghi rog* is brought on by easterly winds accompanied with morning dews and fogs : it disappears if a westerly" wind sets in before the disease has gained too strong a hold. Similar diseases are alluded to in most district reports. The following account of the diseases to which the crop is liable may be abstracted from Mr. Walton's History of Cotton in Bombay :-- Cotton is naturally a very hardy plant, and stands some wonderful vicissitudes of climate and weather, but, notwithstanding this, there are some sudden atmospheric and other changes, which seriously affect it. The most trying consequences are produced by untimely, sudden, and heavy falls of rain, frequent changes of, and trying, winds, and cloudy weather; frost also injuriously affects the plant, but this seldom happens in the Kaladgi and Belgaum country. The rayats often say their cotton plants are struck with rog (disease), when nothing of the kind has really occurred. One set of circumstances which causes this mistake, is when unusual heat comes on with an excessively dry atmosphere; and the roots of the plants have not reached down to a moist sub-soil. When this happens the branches and leaves first droop, then dry up, and eventually turn brown, getting the appearance of having been burned up. It is this brown appearance that the farmers sometimes mistake for blight, when the phenomenon has in reality occurred from the above causes only. Cotton is essentially a sun plant, and if the sub-soil of the fields,

where it is sown, is in proper condition for imparting the required sustenance through the tap-roots, no more rain is needed, and at most times, especially if heavy, any rain that falls after the bushes are about a foot high is injurious. If the fall is heavy, even before that time, it almost **G.** 98

* Bombay Cotton.

(Watt & Murray.) GOSSYPIUM.

always does serious harm. Anything and everything that happens to cotton, and makes the plant look unhealthy, if even for a time only, is called by the native cultivators <i>rog.</i> According to the local farmers, there are some five or six of these diseases to which cotton plants are liable, and they are given below in the order in which they may affect the staple in its gradual stages of growth as follows:—	CULTIVATION in BOMBAY, Diseases.
(1) <i>Banti roga</i> , or 'yellow disease.' This is caused by untimely and excessive rain flooding the fields. The effects are worst where drainage is defective. The stems and branches become a dirty yellow colour, the leaves red, and the bush droops; and if the disease is not arrested by the excessive moisture getting away in time, the plant dies.	Banti roga. 99
(2) <i>Banji roga</i> , or • barren disease.' This is brought about by hard eas\$ winds blowing night and day, together with cloudy weather. The progress of the plant seems to be arrested; it ceases almost entirely to show fresh leaves, and the development of flowers and bolls quite stops.	Banji roga. 100
(3) <i>Gugari roga</i> : this name literally means "half-cooked grain," and implies that the state of the soil and atmosphere has had the effect of partially boiling or cooking the plants. It is brought about by excessive moisture, and dull oppressive weather, with heavy clouds overhead, and but little and variable winds. The leaves fold and dry up.	Gugari roga. 101
 (4) Shidihayu.—This rog is caused by long.continued harsh north-east winds, and is characterised by the leaves drooping; it is seldom fatal to the plant. (5) Kari jigi roga, or the 'black sticky disease.*—This is quite the 	Shidi hayu. 102
worst of all the ailments that the cotton plant is liable to, since, when it has once taken hold of a field, and the plants are far advanced, they hardly ever recover. It is produced by long continued dews and unceasing easterly winds, and shows itself by a thick, dark, gum-like substance covering the plants. This so entirely covers and closes up the leaves, that they, the flowers, and the half-developed cotton-bolls, all die and drop off, and, in a short time, a field, that had the appearance/>f strong, green, healthy bushes, shows nothing but some charred-looking dirty sticks. Both descriptions of cotton are liable to all these ailments, but the acclimatised American may be considered the more susceptible of the two. The plants show their wonderful vitality and innate hardiness by rapidly recovering from disease, when the causes, which have produced it, are removed. All the diseases cease when a favourable change occurs, and genial, seasonable weather ensues for a'sufficiently long period. If any of the ailments have attacked the plants in the earlier stages of their growth, and they recover, no eventual harm is done. The case is, however, different when it happens at a late stage of their cultivation,—the yield of cotton is then affected both in quantity and quality, the fibre is almost sure to be short and weak, and often dull in colour. (<i>History of Cotton, 113-114-</i>). In 1867-68, a great part of the cotton-crop of Bombay suffered from blight, the effects of which were investigated and fully described, by Dr. Forbes . Thecause, he believed, to be exceptional climatic conditions similar to those detailed above; the effect was drooping, withering, and final death of the plants. Dr. Forbes sums up his report as follows :— "This wind-blight is the bane of the southern districts. I have seen seasons pass without the slightest appearance of it, but of late, its occur- rence has been more frequent, and its influence progressively more severe- ly felt * * *. It may be described as the effects of a hot wind, mo	103

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Picking of Bombay Cotton.

CULTIVATION in BOMBAY. Cotton picking,

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accompanies it; its action upon the cotton plant is direct and speedy, and no amount of moisture in the soil will avert it."

COTTON PICKING-In Bombay, the picking of indigenous cotton usually commences in December and is completed in May. In the Presidency, as a whole, it would seem that the above dates are correct, although slightly different periods are recorded, in works treating of this subject^{*}. Thus, cotton picking in Khandesh is said to extend from the middle of October to the middle of January (Gas., 154). According to Mr. Beau fort (Indian Cotton Statistics, 24) picking commences in December ana is usually completed in March. The difference between these statements may be due to the introduction, since the date of the *Gazetteer*, of forms or cotton which mature later. "The average proportion of clean to seedcotton is one to three. Seed-cotton, fallen on the ground, contains a certain amount of dirt, which is partially removed by beating it on the *jhanji* or *thdtri*, a bamboo or cotton stalk wicker-work frame." *{lia*etteer*). In various passages, quoted above, the picking¹ and cleaning o^{*} cotton has been incidentally dealt with, and the habit of criminal adulteration laid mainly to the charge of the dealer, not the cultivator. In the paragraph below, on the Improvement of Bombay Cotton, the legislative measures formerly taken, and since repealed, to check adulteration, will be found briefly reviewed. The final conclusion arrived at by most writers seems to have been that careful selection of seed on the part of the cultivator, and stringent measures by the wholesale dealers to bar systematic adulteration from the market, would effect a complete reformation in the Indian cotton industry. It has been contended that the matter rests more with the merchant than the Government, and that what impurities are due to the primitive methods of collection would soon be naturally reformed if the necessity for such reform were made to be felt not only by the primary dealers but by the cultivators. Pressure brought to bear on the local dealers, by those at the centres of baling, would go a long way towards giving a new life to Indian cotton cultivation.

Improvement. **IO5**

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⁴ IMPROVEMENT OP BOMBAY COTTON.—LEGISLATION TO CHECK AD-ULTERATION.—In the "Note" on Cotton, published by the Revenue and Agricultural Department, the following passages occur regarding the history of the legislative measures taken to prevent the injuries effected on the cotton industry through the practice of adulteration, that for some years prevailed to an alarming extent :—

"The subject of the improvement of the cotton culture and trade of the Bombay Presidency has occupied the attention of Government and of the commercial public for more than half a century. The introduction of American and other forms commenced seventy years ago. "But the evil existed then, as it does even at the present day, of mixing indigenous with exotic, thus bringing discredit on the industry. It was not till after i860 that measures were planned for endeavouring to stop this evil. In that year the practice of mixing local and New Orleans brought the Indian-grown form of the latter into disrepute. (Shortly alter, Government, however, appointed a Commission to enquire into the subject. I he Commissioners found that— during the season in which the enquiries were made, little or no local or American cotton had been shipped clean or unmixed. Besides the mixing of different varieties of cotton the dealers admitted that their cotton was mixed with seeds and other rubbish, and that it compared badly with the exports of other years. Many of the local dealers were anxious that the trade should be regulated by law and placed under inspection. In tileir report the Commissioners stated that the evils of the Dharwar cotton trade were beyond usual remedies, and affected not only local but general interests. Nothing but the energetic action of Government could check so widespread an evil. Existing laws were insufficient; a fresh Act was required. With their report they submitted the draft of a Cotton Frauds Rill. This measure became law in July 1863 as the Bombay Cotton Frauds Act, IX. of 1863. The first Cotton Inspector appointed for Dharwar was Captain (now Colonel) R. Hassard of the Bombay Staff Corps, who had already received charge of the Dharwar factory from Dr. Forbes on his appointment as Cotton Commissioner." (Dhdrwdr Gazetteer, 2Q4—2QS) Improvement of Bombay Cotton. (Watt & Murray.) GOSSYPIUM.

"The Act proved more or less inoperative. The Inspector found it very difficult CULTIVATION to establish the mixing, at the gins, as Iraudulent under its provisions, and its operation thus brought to light a defect in the provisions regarding fraudulent mixing. To BOMBAY. thus brought to light a defect in the provisions regarding fraudulent mixing. To be fraudulent, mixing mustItake place in cotton either offered for sale or offered for pressing. There were no presses in Dhárwár and the cotton was sold, not in Dhárwár but in Bombay. So the Inspector might see in a ginning yard a heap of local, a heap of American, and a third heap of seed to be added as a make-weight, and yet fail to secure a conviction.'' *{Dhdrwdr Gazetteer, 2gs}* 'Ihe result was that out of many prosecutions, all of which were aggravated cases, clearly within the spirit of the law, very few convictions were procured. In 1873, the European merchants of the dis-trict as well as the local officers consequently pressed for a more stringent Act. In 1874, Government appointed a special Commission to enquie into the necessity for continuing the law to suppress cotton frauds. ' The majority of the Commission after collecting a large amount of evidence were of opinion that though it was not advisable to annul the Act it was preferable.to place it in abevance for a time. When the matter Improvement. to annul the Act it was preferable to place it in abeyance for a time. When the matter was referred to the Secretary of Stdte, the Bombay Government were directed to pre-pare a fresh Act with the object of remedying the defects of the existing measure.¹ (*Dhárwar Gazetteer, 2gg.*) ¹⁴ Act IX. of 1863 was repealed by Act VII. of 1878. These Acts appear to have been extended to Berar but not to the Central Provinces (*Cotton Commissioner's Banear for 1869 (0)* 275). In Soutember 1870 Legislation.

Report for 1868-69, 275). In September 1879 the Government of India recom-mended that all special legislation for the suppression of cotton frauds should cease. The Secretary of State did not then agree with the view held by the Govern-ment of India, though in March 1880 he sanctioned its proposals and desired the Bom-bay Government to do away with the special cotton fraud prevention establishment. Act VII. of 1878 was repealed by Act I. of 1882. 'According to Mr. Walton (Cotton Dependent) the opinion of the logal European Agents and Nation more than the special European State and State State

Act VII. of 1878 was repealed by Act I. of 1882. 'According to Mr. Walton (Cotton Inspector) the opinion of the local European Agents and Native merchants was opprsed to the giving up of Government efforts to check frauds. According to Mr. P. Chrystal, a Bombay merchant who is well acquainted with the Belgaum and Dhárwár cotton trade, the Bombay dealers and merchants in Ameiican Dhárwár and Coompta cotton think (18S3) that the Cotton Frauds Act failed to stop adulteration in the ttombay-Karnatak. Mr. Chrystal thinks that since the Act has been stopped, there has been no noticeable increase in the adulteration'' (*Dharwar Gazetteer, joi*). CAUSES OK ADMIXTURE.—The Collector of Khandesh, when referring to this admixture in 1878-79, pointed out that admixture begins with the sowing. The Khandesh ryots do not keep a portion of their crop for seed, as is customaiy in the Deccan, but depend for seed on the *bania*. The *bania* receives all kinds of cotton. That purchased from the pickers, who receive their wages in kind, must often* be mixed. He sells this and what he has received direct from the cultivators to the large dealer, who has it ginned and pressed. The admixture so far may be done in ignorance, but on Mr. Robertson's authority I say that wilful admixture takes place at the hands of the large dealers and of the agents of the large ginning and pressing ignorance, but on Mr. Robertson's authority I say that wilful admixture takes place at the hands of the large dealers and of the agents of the large ginning and pressing factories. At no single stage of this complicated business would honest and wise conduct succeed in preventing the evil. If the rayats sow pure seed, and keep their seed pure, the *banias* will mix it. If the *banias* were to guarantee good seed and to sell only such, they would have to charge a higher price for it, and the rayats would probably prefer using cheaper stuff which they would manage to find. If the large firms were to reject mixed cotton, their factories would be idle. Combined action is essential, but as unlikely as it is essential.'' "The Director of Land Records and Agriculture, Bombay, in his annual reports (the main facts from which may be here reproduced) has repeatedly discussed the

(the main facts from which may be here reproduced) has repeatedly discussed the subject of adulteration and its possible prevention :-

"1884-85.—The subject of adulteration is of such importance that I feel it my duty here to state carefully the whole case before Government, for only a full statement can explain the final deliberate decision that practically nothing at all can

be done. "The Secretary of State forwarded a communication received from the Liverpool "The Secretary of State forwarded a communication received from the Liverpool Chamber of Commerce calling attention to the increased adulteration of East India cotton—a subject of very great gravity—a growing evil which seriously imperils the foremost staple of India, at the same time affecting and disturbing most grievously the cotton trade. In due course the opinion of the Bombay Cotton Trade Associa-tion was solicited. This body informed Government that their attention had already been directed to the matter in such a way that they had been induced to appoint a special Committee to consider the question of mixing and adulteration in all its bearings. The conclusion arrived at was then announced—

•' Having thoroughly considered previous legislative enactments on cotton frauds,

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Admixture, 107

Admixture of Bombay Cotton.

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in	and ons connected therewith V1* the white * and havi & f before them, the resolutions, the 'white way the Liverpoof Chamber of Commerc Tthey had, nevertheless, cr * 10 the 99 Heldside that special legislation was
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	Crawfortcomm^j S. D., in Dharwar, was a direction initiated by Mr. A. T. might be 'mitated JnXV districts with advantae. "I proceedings of the meeting held to consider the report of the Social
	^ummutee were at the san.e time forwarded to Government
	Specill C o m m $^{\circ}$ e $^{\circ}$ T e $^{\circ}$ J a $^{\circ}$ r $^{\circ}$ ⁸ ^I W $^{\circ}$ * **%» «* the members of the
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	that when the effect on the intof $VSTT^{\prime \prime \prime}M^{out}$ or $^{s}P^{ee}$ ** ** ** **
	discussed, and when the mann h_{t} h T_{t} h h trade has been conducted since the withdrawal of gravitational logitation h
	withdrawal of special l e r i T S TM w ^l "ch the trade has been conducted since the further legislation w^snofadv^ble^ $C^{Onsidered, the}$ /^*/g became universal that
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1	inther legislation w^snotadv/ble/ bounder arther // * g became universal that "It was admitted first «« universal amou? of admixture' had become prevalent ince the he Cotton Frauds Ac.) and tht ⁴ this Amixture was a decided
	and a source of loss', o c infinite was a decided
	uid concern themselvee
	"The Chairman gave his opinion that mixing had during the past season been of a less consistent character, and that professional mixers had not been so success- ful. He charged the native dealers
	ful. He charged the native dealers
	turn by their special knowled
	must they became bolde, 1^{the} T^{rowth} of the practice soon b
	must they became bulde," 1 the $ T^{rowth} $ of the practice soon b. matters to a criss, and a set of FulC ''51 frm (and to combat the evil. if the practice soon b. p v clauses were however, ET_{inv} iou and u '' r kable. Contracts users made The
	P v clauses were however, F^{TM} iou nd un related to combat the evil. if the native deale chants were comM ^ i ^ f i f f o misfion of the evidates and the European mer- tand taken a sinst mixing, the Chairman though with a purpower that are in the first of the chairman theory with a purpower the derivation of the first of the chairman though with a purpower the derivation of the first of the chairman theory with a purpower the derivation of the first of the chairman theory with a purpower the derivation of the first of the chairman theory with a purpower the derivation of the first of the chairman theory with a purpower the derivation of the first of the first of the derivation of the first of the derivation of the first of the derivation of the deri
	chants were com M ~ 1 ~ f 1 ft om flow / w w the European mer-
	"tand taken against nixing, the Chairman thoug and an improvement had set in.
1	"The deliberations of the Committee were then described as to the form which legislation, if decided on, should take. Fatal objections appeared to arise against every suggested ovision. In fine, it seemed clears that a mild be arise against
	every suggested ovision. In fine it monoral supported to arise against
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	s, which would simply be the re-insti-
	which had brought about its abolition. The 'e 'Jftat3S'SS
	rominently-but no emphasis could be too strong-stated that deterio- was the great evil to be feared, and the
Í	that during the second state of the second state was noticed
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	mediable mixture of seed, which would •SIS? kapas . The ourse, meant irre-
	"Next, the improvemen effetd hl!" AshKill non by substituting Hingon
	it was admitted that, during the ti
	the evil of admixture had risen and
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	tion, -in other words, which fo SrSSC if the trade which isserted the deteriora-
	« The Chaiman, hip w p f te
	ernment should be invoked, w J 1 I? found from actual experien $c^{A}SSji*$ the following effect—that it had been to establish and adhere tn a set of trade rules which would effectually put a stop to
	to establish and adhere the set of owing to the constitution of their own body,
1	the Practice of niixing trade rules which would effectually put a stop to
	quite strong enough to make a rigid set of rules, which, if loyally adhered to, would go a long way to putting an end to the system of mixing.
1	go a long way to putting an end to the system of mixing.
	Association. If the trade can and write it is "Sfh-dewed result can be effected by the to do nothing at all will be fully write of "i j he my xing then Government's decision
1	to do nothing at all will be fully usfill \mathbf{F} i \mathbf{J}^{new} $\mathbf{V}^{\text{xinstituten}}$ Government's decision

Association. If the trade can and which $j_{ij} = j_{ij} = j_{ij}$

Admixture of Bombay Cotton. (Watt & Murray.) **GOSSYPIUM.**

will not stop mixing, it will, in my humble opinion, be incumbent on Government to seek to stop it without permitting interference with the trade or the obstruction caused by Inspectors, to weigh against the demands of the country and the welfare CULTIVATION BOMBAY. Admixture.

of the ray at. But I am anticipating. , _, , , _ . tuci.1.1 ur "The Collector of Khandesh, Mr. W. H. Propert, was the first to lay before Government his estimate of the practicability of the advice offered by the Association.

"He pointed out that no effort had been relaxed by the Revenue officers—(1) to prevent the extension of *varadifi*, for he had oftentimes gone near overstepping the bounds of legal authority to check its spread; (2) to encourage the cultivation of im-proved varieties, for at the Maheji Exhibition handsome prizes had been yearly proved varieties, for at the Maheji Exhibition handsome prizes had been yearly awarded for the best samples of exotic cotton; and (3) to supply pood seed, for the Government Farm had for its main object the production and distribution of as much good seed as possible; but that in 1882 the rayats got out of hand for two reasons, first, they had become fully aware that no restraining authority remained in the hands of the Collector, and, secondly, the price given for *varadi* had reached or nearly reached that accorded by the trade to the better staples of the Dharwari (ac-**Climetre** d Am©r (can) and Hingangháti. u !**JTE** showed that the producer has very little voice in the question as to what crop snouid be sown. He gets his seed from the middleman, and his crop is virtually dis-posed of, seed and all, before it is grown.

He admitted that the ryot prefers to grow the indigenous variety, which is reared with far more ease and yields a heavier crop. When the demand rose for this commodity, it was very easy indeed for the middleman to extend its growth at will. and he asserted forcibly that if for one season (1883) the merchants had refused to <u>3my varadi</u>, or had at any time, within the past three or four years, assisted him in his snorts to sustain the good name of Khandesh cotton, the *varadi* cotton would have been virtually stamped out.

. "Next, turning to the question of the distribution of good seed, he indicated his reluctance to look again to the Berars, because there was evidence that the system of admixture had worked harm there as well as in Khandesh, and there was little prospect of advantage from the re-importation of this Hingangh&ti variety, which is not BO valuable or generally suitable as the Dirarwari. And so with regard to Dharwar; the fact of Mr. Crawford's movement to improve the cotton of that distiict shows that the staple has deteriorated there also. Therefore there is risk in applying for seed thence. But Mr. Propert argued that in Khandesh itself it is possible to collect a large quantity of good seed by separately picking the bolls of the exotic cotton grown in and among the indigenous crop, relying on the fact that the former ripens earlier than the latter. than the latter.

... "I may parenthetically remark that good cotton can be procured from Dharwar. Experience has shown that seed acclimatized there succeeds better in Khandesh than freshly-imported seed; and though the Dharwar seed has deteriorated, its transfer to Khandesh will almost certainly give fair results. The plan recommended by Mr. Propert of collecting seed in Khandesh, too, is feasible. But, as is clearly argued, there is no possibility, under present adverse circumstances, of getting good seed sown. By the kind offices of one of the leading merchants in Bombay I was informed that his up-country agents could not, if they would, at present induce cultivators to sow the exotic cotton. Perhaps this opinion should be received with caution ; for, as all the reports tend to show, the rayat is not the arbiter in this matter.

" Mr, Propert sums up with his advice that dishonest mixing should be made penal. He holds out the alternative that the Bombiy merchants for one year should refuse to buy the mixed cotton. But the reply to this is that the merchants cannot

anord to consider any such scheme. "The Commissioner Mr. E. P. Robertson-after, I think very wisely, Insisting that the coercive measures adopted by Mr. Ashhurner some years, $fg^\circ \operatorname{TM}\mathfrak{L}^{a-1}\mathfrak{L}$ gether over-estimated as regards their good results-says that Government mayefull Fight to interfere by dictating to the people what cotton they il ^ d • » $\mathfrak{c}r^{a}\mathfrak{r}_{a}$ if supports the demand-for a law to punish ^ r t t j w - w g ^ peir vehe-that the merchants can hardly plead for the re-imposition of ^ the ^aw^{TM}\mathfrak{L}^n $\int_{inced that}^{inced that}$ ment opposition caused to be abolished, however much they may De convince that law is wanted.}

"Independently I represented my view of the question. The object of my letter "Independently I represented my view of the question. The object of my letter was to show that the advice of the Cotton Trade Association is futile, based on a misconception of the position of the rayat. I tried also to give reasons why the method of improvement initiated by Mr. Crawford in Dhárwár would do no good in Khandesh.

• Varadi in Khandesh- Vilayati-Khandesh in Berar Conf. with pp. 58s 89-9¹-

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Admixture of Bombay* Cotton.

I called attention to the late discussions in the Berars, and to the late Mr. Ridsdale a CULTIVATION In able review 'of the whole matter, in which he showed that interference with the BOMBAY. rayat is not justifiable on either administrative or economic grounds. This review was called forth by the resolution of a meeting that the action of Mr. Ashburner in 1873 had secured wonderful results in Khandesh, but had been detrimental to Admixture the Berars, in that it caused an influx into that Province of the seed of the » stapled variety ousted from Khandesh (which in the Berars is called Khan* deshi, and which in Khandesh is called Berari or *varadi*), thereby woiking much harm, and that the imitation of the policy of Mr. Ashburner would rehabilitate the cotton of the province. The Government of India, Revenue and Agricultural Department, prevented any action being taken by the plain statement of the pia>n fact that Mr. Ashburner's policy in Khandesh had not secured lasting results. I endeavoured to make it clear that though the Dhaiwari cotton does well in soⁿ parts and some soils in Khandesh, it is not suitable to otheis-that it would be an evil to attempt to stamp out varadi (or Khandeshi cotton), inasmuch as that vane, v is the only paying one in its peculiar soils. Further, that the production of *varaat* has its recognised and justifiable value, though the cotton is useless for'*export, except for purposes of admixture. *1 ventured to suggest that the earnest desire of the Cotton Trade Association to evolve a workable method of preventing fraudulent admixture, and the no less earnest anxiety of the District Officers to assist in the movement, would be best fostered by the appointment of a Joint Commission of merchants and revenue officers to enquire into and discuss the whole matter. On the one hand, the meichants would see how unworkable the advice offered by them really is, and, on the other hand, the Revenue Officers would learn much as to the most feasible method of meeting the evil without disturbance of the trade. "With well-sifted information on the various points noticed, the Commission, I thought, would be in a position to recommend a feasible working-plan. chants would then be entitled to call on District Officers for co-operation, and the District Officers would know what support they could expect from the trade. AC present in their eyes, in spite of the enlightened and well-intentioned declarations and. warnings of the organised mercantile associations, the trade is doing everything it can to checkmate their efforts at every step. "1 casually hinted at the feasibility of establishing warehouses near the ginning and pressing factories where cotton received should be sorted and cleaned. I neea only say that this plan is universally declared to be unpractical, and I do not wish to . pretend that I am able to elaborate a scheme in connection with it. "All these papers were considered by the Chamber of Commerce and the Cotton Trade Association. They were practically a challenge to the trade, and the trade could not take up the challenge. The former body explicitly stated that the admixture is due to a demand in Europe for inferior stuff. "So long as there exists a demand in the consuming market of Europe for the inferior descriptions of cotton, so long will merchants continue to purchase, mid lie-men to mix, and growers to cultivate it. No good end could be served by attempt* ing to interfere with the natural course of the trade. The Chamber went on to urge that there are signs of a re-action against mixed cotton, and advised Government to take energetic steps to distribute good seed throughout the districts, presumably to be ready to meet an improved demand. "The Cotton Trade Association, indisposing of the reference, con tended that there are buyers in Europe of adulterated and mixed stuff on its merits, and that merchants are bound to deal in it. It is, therefore, presumable that much of the adulteration which now goes on is not fraudulent. Certainly the former proceedings of the Association give me, at any rate, a different idea of the matter. It seems to me to be merely removing the fraud one stage further on, for these buyers in Europe of adulterated and mixed stuff on its merits, paying the high price they do for the chief ingredients (worthless 'on its merits) of the mixture, cannot be credited with honest dealing. "The orders of Government were that no steps to stop the supply of a coromodity which is grown to meet a demand by consumers can be taken. As regards the latest advice of the Chamber, it was pointed out that, till the improved demand for good cotton docs arise, it would be premature to distribute good seed. It must be drawn from these orders that Government do not approve of any legislation to check fraudulent mixing. * The course of events must be watched; but whatever is done in the matter ?^u f^a b^c-^{done} Without consultation with the trade. It is, in my humble opinion, hardly fair to ask the merchants to show how the rayats can be protected from byinjury resulting from the course of the trade. On the other hand, the perusal of the G. io7

Admixture of Bombay Cotton. (Watt & Murray.) GOSSYPIUM.

deliberations of the Cotton Trade Association gives the fullest confidence that whatever can be done on their part will be done.

ever can be done on their part will be done. "The Commissioner, N. D_A Mr. G. F. Sheppard, brought to the notice of Government a specific instance of the importation into Broach of 179 tons of *dhol lera* cotton to be ginned. It may be presumed that this was for the purposes of admixture. Clean cotton cannot be successfully mixed. Mr. Sheppard also noticed that annually a very inferior variety of cotton is exported to Dhollera from the Kaira district. He enlarged on the greater danger from deterioration of the seed than from mere, admixture of staples, and urged that the subject demands consideration in the interests, *not* of the trader, but of Government itself. "He contended further that it is easier to prevent admixture of seed at the begin-

"He contended further that it is easier to prevent admixture of seed at the beginning, than to restore the high character which a crop has once lost. He advised that the Collectors of Broach, Surat, and Ahmedabad should be directed to watch importations of interior *kapds* and authorised to buy up the seed either pure or mixed. I here can be no objection to such a plan. The seed would be useful for cattle food and tlje loss nothing, because it may be presumed that a lot of seed, stigmatized as mixea, would not knowingly be used for sowing. I trust that the Commissioner will carry his suggestion into practice.

"Mr. Stormont, of the Bhadgaon Farm, made a short tour chiefly to ascertain the extent of admixture *in the field*. The following may be quoted from his report :—

**Tour in Cotton Districts.—About the beginning of February the Collector T Li 1,1 A 1 • x-r ** directed me to make a short

					AVERAGE MIXTURE.					
PLAC	Е.				Varadi.	Hingan- ghati.	American			
Pachora				_	Per cent. *5	Per cent.	Per cent.			
Yaval Arrawad	:		•	•	58 70	40	43 6			
Chopda Dharangaon			•		75	30 25 20	30			
Erandol		•	•	•	50 58	20 29	13			

directed me to make a short tour in the eastern talukas with the object mainly of finding out to what extent mixed cotton seed was sown by the cultivators; also whether, as a alleged, merchants were paying preference prices for the short-stapled *varadi*. ^ My inspection embraced a circle of districts including Fachora, Bhusaval, Savda, Chopda, and Erandol. The results of the analysis of numerous samples are c>ranged in the margin.

"A glance at the table will show that the crop of Khandesh still contains a fair percentage of good cotton. At Pachora it is nearly half American; the short-staple being only a quarter of the whole. This is admittedly due to the spare farm seed being annually sold in the neighbourhood. At Bhusaval no reliable sample was obtainable, but about Yaval the American element diminishes to o per cent.; at Arrawad and onward to Chopda it altogether disappears, until the vicinity of Dharangaon is reached, wherewith the Hinganghati it makes up half the crop. Coming southward by Erandol the varadi again predominates, being just outside the circle under the influence of the farm.

⁴⁴ Opinion of Cotton Merchants.—At Dharangaon a number of merchants and others met me to discuss the question of cotton improvement. The smaller class of local dealers were strongly opposed to any measures of restraint, declaring that although the price of varadi was comparatively low, still the cultivators liked to sow a certain mixture, it being the more reliable poor man's crop.
"The Bombay buyers, on the other hand, were unanimous in opinion that only

"The Bombay buyers, on the other hand, were unanimous in opinion that only the operation of an Act could ever restore the reputation of Khandesh cotton and the consequent prosperity which its producers enjoyed for so many years. All, however, were agreed as to the beneficial results which must necessarily follow the distribution of large quantities of good seed.

⁵⁶ "It seems to me that Mr. Stormont has missed one point, deducibie from his enquiry,—that is, that the further he went from the railway and from cott n centres (*e.g.*, Dharangaon) the less the percentage of good staple. '1 his fact would seem to show that the suitability of the indigenous variety, apart from the support accorded by the demand for admixture, has a strong bearing on the increase ot *varadi*. The deduction may be wrong, but if it is correct, it is a warning that a place for this variety must be recognised as necessary (see paragraph above).

1885-86*—" I have very little to place on record respecting this important staple. No further movement has taken place in the direction of check against admixture,

Admixture.

CULTIVATION In BOMBAY. Admixture.

Exotic

Cottons. 108

Introduction of Better Oualities of

and I have no district agency to record the damage done by carting seed-cotton from districts, where the staple is bad, but the colour good and the cotton cheap, to $b^{\mathbb{C}}$ ginned with superior cotton. That this admixture goes on I have no doubt, and it is certain that the mixed seed is sown in the localities where the ginning is done, to the treat detriment of the crop. One circumstance, however, is worthy of note. The Liverpool Chamber of Commerce has established a new standard which will be known as *bilati*. It will include the short-stapled *omra-wattee*, and will apparently be a direct check against the export of the short-stapled varadi as it is called in KhAn-desh, or Khandeshi as the Berar people chose to denote it, under the standard of omrawattee. It remains to be seen from the quotations and trade returns the price which the new standard will command and the proportion it holds to the whole crop.

In concluding this series of quotations from the best sources regarding adulteration and the measures that have been taken to repress the practice, it may be added that the modern demand for Indian cotton, consequent upon the great trade created by the American war, was not the primary cause of these measures. From the earliest records of the Indian "export traffic (somewhere during the last decade of the eighteenth century j up to the present time, complaints have been rife. Thus, **Dr. Hove** in 1787 wrote, "I observed to-day, when they were embaling the cotton, if they" (the dealers at bynapoor) " adulterate it with any ingredients as it is reported in Bombay. But in justice to the inhabitants, I must say that they paid a particular attention that nothing impure was communicated, in which state they deliver it to Broach, where the cotton *is* adulterated with their own inferior sorts and that of Baonegar, Bodra, and Dolea to make it resemble that of Ahmood, which is first mixed together, as I am informed, and then passed again through the cylinders, by means of which it is so intermixed that the ablest connoisseurs mistake it for the original. To this adulteration the merchant has nothing to say and is very glad to obtain it in that tion the merchant has nothing to say and is very grad to obtain it in that manner. But the same on coming to Surat is adulterated by Europeans in such a manner that all this which was sent from here of late on our Company's account to China lies unsold and for which they paid the contractor a most exorbitant price who gained unlawfully, by the mformacjon I had here, no less than £25,000 sterling. As the method of adulteration of adulteration of the sentence tion was not secretly enough performed, it was of course immediately communicated by the agents to their correspondents here, that they might also adulterate it and send it in that manner to Broach. The method which the well-known contractor for that cotton practised was as follows : he purchased a large quantity of old cotton seeds which is sold publicly in the bazars as food for cattle, then opening the bales he intermixed a certain quantity of it with some other rubbish, and closed it in the first state in which he delivered the contracted quantity to the respective commanders on the Company's account for China."

INTRODUCTION OF BETTER QUALITIES.

In referring to the introduction of exotic cotton into the presidency, the Director of Land Records and Agriculture says in his report for 1884-85 :-

m "(a) American.—The valuable staple acclimatized from American seed is well established. Its cultivation is liable to fluctuations with the rise and fall of the demand for good stapled cotton, but it will not disappear. Us hold is especially strong on the three talukas of Bankapur, Karajgi, and Ranebennur in Dharwar, and the large areas of the surrounding Native States. It does not do well in the deep black-soil talukas. Its advantages are:-

- (2) its outturn becomes sooner certain, and advances can, therefore, be earlier secured on the crop;
 (3) cleaned by the saw-gin it economizes manual labour, and this
 - at the time when this labour is in great demand ;
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Cottons into Bombay.

ay. (Watt & Murray.) GOSSYPIUM.

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"(4) >n good years its yield is very high; "(5) though more liable to blight than the indigenous variety, it	CULTIVATION in
possesses greater power of recovery.	BOMBAY.
*' The question of introducing this variety into neighbouring districts,	Exotic Cottons.
fcjp"., Bijapur, is very important."	Cottons.
The experiments with exotic seed, however, appear to have proved unsatisfactory in 1884-85 and 1885-86, but further trial was subsequently	
made with fresh seed imported from America. This was tried in Khán-	
desh also, but the Director, in his report for 1886-87, states that it had been	
clearly demonstrated that it would be unwise to force exotic American	
cotton on the KMndesh cultivator as the soil and climate of the district	
was unsuited to its growth. (b) Egyptian,—The Egyptian black-seeded cotton was tried in Dh4r-	
wdr in 1884-85 but failed. It has apparently been also tried in several	
districts without success.	
m(c) Nankin.—In June 1884, the Government of India supplied the	Conf. with
Director with Nankin cotton seed to test the suitability of the Nankin or <i>Khaki</i> coloured action which it was contamplated should be used for the	р. 17.
<i>Khaki-coloured</i> cotton which, it was contemplated, should be used for the summer clothing of the troops in place of dyed cloth. A guarantee was	
given that the produce would be purchased at 4 annas per ft of cleaned	
given that the produce would be purchased at 4 annas per ft of cleaned cotton. The Director wrote in 1884-85 regarding this experiment:—"The	
cultivation of Nankin cotton in this presidency has not got beyond the	
experimental stage, and even experimental cultivation is in its infancy. The only instance known of a farmer growing this cotton on his own	
account is in the Shevgaon Taluka of the Ahmednagar district, where	
one Narayan Raghunath, a Brahman holder of some means, cultivates	
it yearly as a garden crop to the extent of five gunthas. The seed is said	
to have been imported from Delhi about twelve years ago. The cultiva-	
tor manufactures the produce into cloth for his own use. "On the whole, although the outturn under experiment was smaller than	
that of the local variety, it is not to be doubted that as large an area ?	
may be desired can be grown with this cotton if the Government of Thdia continues its offer of 4 annas per ft of clean lint; but without such a	
continues its offer of 4 annas per ft of clean lint; but without such a	
stimulus it is not at all likely to be grown at all. I am very much averse to any attempt at forcing this variety on the country. It may injure our	
staples by hybridisation. Its seed may get mixed with the other varieties,	
and a most harmful, undesirable mixture will result, which, once establish-	
ed, will take long to remedy. No alacrity is shown by the Military De-	
partment to utilise the natural <i>khaki</i> cotton in lieu of the dyed material, and it is not unlikely that a mordant may soon be discovered which will pre-	
vent the now unsatisfactory variations in the colour of dyed <i>khaki</i> . Again,	
experiment has yet to be carried on to decide whether the colour of the	
Nankin cotton can be relied on. I have instituted experiments on this point	
at the Hyderabad Farm. The Nankin cotton has no merit as to staple or yield; and my advice on the matter, as it stands at present, is that all	
attempts to force its growth should be abandoned. I earnestly ask that	
pressure may not be brought to bear on me to do more than experiment	
with this variety.	
•" The following extract from a letter of the Chamber of Commerce^	

•" The following extract from a letter of the Chamber of Commerce^ to whom a small sample of the Shevgaon cotton which was decidedly superior to that grown on the Bhadgaon Farm, was sent—also supports my view :—

view :— "• The staple is short, irregular, and wasty, and would be most unprofitable stuff to work. Under the circumstances, the Committee would strongly advise that the cultivation of this description be confined to those places where it is indigenous, as there would be great danger of its hybri-

GOSSYPIUM	Introduction of Better Qualities of
CULTIVATION in BOMBAY.	dising with the local varieties to their detriment if introduced largely into this presidency.''' The experiments regarding the possibility of securing a uniform colour
Exotic Cottons.	in Nankin cotton by selecting the seeds from bolls of the desired tint, were concluded in 1886-87, when the Director stated that—" The result ot adequate trial is that it is very difficult to obtain clean cotton of a uniform colour, though it is possible to do so with great care in selection of seed; but as the variety of cotton is poor in yield and undesirable in every respect,
	the conclusion is not of great importance. The Military Department has now withdrawn its special encouragement of this variety by experimental results." Perhaps the first person who saw khaki-coloured cotton in India was the late Dr. Hove, who, in 1781, came across fields of yellow-coloured cotton. At first, on being shown the cotton, he thought it had been d}"^d, but
	afterwards he had abundant proof that this was not so. In the attempts narrated above, history seems only to have repeated itself, for, if unknown in 1884, the knowledge in the cotton had only died out. It was perfectly understood a century ago.
Continued Experiments. 109	CONTINUED EXPERIMENTS WITH AMERICAN COTTONS.—The Director found that the exotic cotton seed (acclimatized American) had degenerat- ed, and he therefore determined on importing fresh seed from America. The following extracts from his reports refer to the subject : — 1884-85.—'' I noticed in my report last year that there was a spontaneous
	demand for fresh seed in Bankapur of the <i>white-seeded American variety*</i> the only one of very numerous kinds which has really shown itself worthy of support. But I found that no further action had been taken. The seed has degenerated. It is harder and smaller than it was. Though a good year seems to check this degeneracy, there is, no doubt, need for new im- portation. The demand for new seed is not confined to Dharwar. From Kolhapur I have received a large indent. 1 have placed myself in commu- • nication with the Chamber of Commerce, and fresh seed will be imported.
	"But I have decided on adopting a slightly different plan from that followed heretofore. Fresh seed is very expensive. It never does well the first year. 1 propose therefore to sow the seed in that part of the dis- trict <i>{e.g.</i> , Bankapur) where the variety succeeds best (I may notice that in the deep black-soil talukas of Ron and Navalgund it gives a poor crop in comparison with the yield of the lighter black districts of Bankapur, Karajgi, and Ranebennur) and to distribute the produce at a moderate charge. This plan 1 shall recommend to the Kolhapur State. Specific proposals will be made to Government for sanction to hire land for one year
	tor the purpose." On the subject of the soil best suited to American cotton, the Director wrote: "Dr. Royle pointed out (184.0) one result of experiment which wills I believe, by all be recognised as correct, <i>viz.</i> , that the black soil is no so well suited for American cotton as the poorer soils. I cannot but think that attempts to introduce the improved varieties without regard tc ^{this} fact were so far misguided."
	This opinion should be compared with that arrived at regarding the soils of the*Central Provinces found best suited for American cotton. 1886-87.—" I described last year the new importation of seed and its distribution. I am now able to give a very satisfactory account of the results. In Dharwar in six villages of selected talukas, <i>i.e.</i> , talukas where the exotic cotton has held its own without the aid of official pressuie, sow ings were made by Mr. Price. A little delay arose owing to an untoward break late in August 1886. The season was, on the whole, favourable The average yield was 158U) per acre of seed-cotton. The proportion of
	G. 109

_	(Jottons	s into B	ombay	. {Watt &	Murray) G	SOSSYPIU:
rich j "(2) The bett and "(3) The poo from "(4) The pla cotto "dt must be remen duction, while the p smaller growth of th	luce of the aines, while following of her light bla blain. er the grow discolouration s were larg old acclima nts were st n. nbered that rocess of acc e plants sec	old acc Acting bservati ck soils th of the on. er, thou tised se outer a these re climatis	limati Direc ons : showed e crop ogh fe ed. and lo esults ation point t	sed seed, which etor, inspected th - l better results th , the less the inju wer, than on the wer in growth are for the first y was only comme o some hybridisa	is generally e fields and nan the deep nry by bligh crop raise than the ol year of intro encing. Th	d d
digenous cottons in "The crop was of on the whole, it was of the importation, R233. "Sourings of	considerably everywhere experimenta	better fairly g l sowin	in sor good. gs, an	ne places than in The net cost to d distribution ha	Governmer as been onl	nt
" The crop was of on the whole, it was of the importation, R233.	considerably everywhere experimenta new Americ	better fairly g l sowin	in sor good. gs, an <i>l cotto</i> NT OP	ne places than in The net cost to	Governmer as been onl	nt y N

" I have, under the head, farms, shown the result of experimental sowings at Bhadgaon. A large portion of the new seed was taken over by the Kolhapur Agency. In some States the season was unfavourable. The report received from Miraj Junior states : ' The cotton plant raisect from the new American seed is 3 feet high as compared with 2f feet in the case of the old cotton. The pods are fewer but larger, about in the pro-portion of 2 to 3, but the weight is greater, ten pods of the new weighect 102 to 4 mir of the source number of the old mirighed only 81. These step 103 tolas, while the same number of the old weighed only 8J/ These notes

correspond with Mr. Baines' observations. "In the Panch Mahals Mr. B. A. Dalai sowed the, new cotton. It gftve a poor yield, but he likes the quality of the sample.

CLEANING OR GINNING OF COTTON IN BOMBAY.-Mr. Beaufort writes under this subject:---'' The Broach and Dhdrwdr growths are the only ones which are entirely cleaned by steam or hand saw-gins, but the quantiby of *oomras* and *dholl'eras*, thus treated, is 'yearly increasing. All other descriptions of Indian cotton are hand-cleaned by the native *churka* or foot-roller.'' The following extracts from the annual reports issued by the Director of Land Records and Agriculture give the most recent informa.

GINNING' ZIO

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Cleaning or Ginning of

GINNING tion on the subject of saw-gins and the extent to which they are at present used in Bombay Presidency:-BOMBAY. 1884-85.—" One of the most important questions in Dh[^]rwar is with respect to the saw-gin. A reference to the Gazetteer* will show the various steps which led to the introduction of this necessary concomitant of the American cotton, which has established itself in the district, and the reasons why the management of the saw-gin factories still remains in the hands 01 Three years ago it was discussed whether Government Government. could not safely retire from the direct manufacture, distribution, and repair of the gins; but it was resolved to await the advent of the railway, when it might reasonably be expected that steam saw-gins would be set up ov, private firms. The railway is opened, but there is no indication yet ot any such enterprise. There are steam gins at Hubli and Gadag, but the roller pattern is used. "I sought to ascertain whether the people could not now be left to themselves to arrange for the repair of their gins. There is a great deal of discontent among them. The factories are made self-supporting by a subscription of R6 per annum per gin from each owner. The tax may be evaded by the deposit of the saws and spindles at one of the factories. The owners are entitled to the services of trained hands on payment, over and above the general subscription, for wages and material. The complaint is that the trained workmen kept are too few, and that only those villagers who live close to the factory get any benefit. On the other hand, more labourers would entail a larger subscription, and apparently the people are not careful to have their gins repaired in the slack season, but wait till the ginning time comes, and then, finding something g^o wrong, all clamour lor the factory-men. At Hubli and Ingalgi the rayats assert that they can make their own arrangements, provided Government will assist them in procuring new saws and certain working parts and new gins when required ; but everywhere else there was a consensus of opinion that .»Government must keep the factories, and I believe this is a necessity. It can only be hoped that private steam saw-ginning factories may yet be started. There is one gin worked by bullock power at Halyal near Hubli. At Devgiri I saw another being set up. There is a third, now unused, also near Hubli, and at Ingalgi there is a prospect of another. This utilisation of bullock power must be encouraged. It will reduce the labour now falling on the factory workmen, for the rayat who works a gin with bullocks is in a position to employ his own skilled hand. It may be advisable to seek to introduce Gordon & Co.*s bullock power into this district. This machine has no place to fill in Khdndesh, but there may be benefit in Dharwar. " A new pattern of saw-gin has lately been introduced into Dharwar. It is a great improvement; but the people, I think naturally, complain that the improved grid might have been adapted to the old frame-work and other working parts instead of necessitating their purchasing an entirely new gin. They do not like the new grid. It is too good, and cleans the cotton too well to suit the degenerated demands of the trade. The larger outturn of the old grid is solely due to the large percentage of seed carried through. The same feeling shows itself also in respect to the foot-roller. This rude implement worked by women can compete, and does compete, successfully with the steam-rollers, because the trade is not particular, and prefers buying cheaply half-clean stuff to giving a remunerative price for well-cleaned cotton. " I may mention that the foot-roller-for indigenous cotton only-I^s the implement used all over the Southern Mahratta Country, but that • Dharwar Statistical Account, Vol. XXII., 366-373. G. no

Cotton in Bombay.

contri- |

Bombay Cotton Trade. Ill

{Watt & Murray.) COSSYPIUM,

strange to say, the *hand-charka*, very similar to the Khåndesh *charka*, is again found in the very south of the district."

1885-86.—"I am glad to report that the Haliyal saw-gins are now worked by steam instead of by bullock power. This is, however, the only place in the whole Presidency except the two Government farms, where the steam saw-gin is used to clean cotton. No change has taken place regarding the manufacture, repair, and distribution of hand saw-gins in Dharwar, described in last report.

" At Bhadgaon, now that Mr. Stormont has a steam engine, he will work saw-gins to clean the farm cotton and the small amount of the Dhárwa'V-American still grown in the neighbourhood from farm-seed. At Hyderabad, an experiment with the saw-gin for cleaning the indigenous cotton has been most successful The whole of the farm crop was ginned wite* the improved saw-gin sent from the Bhadgaon Farm driven by a six horse-power engine. Mr. Strachan reports that the cost was Ri-3-1 per maund of 84ft as compared with $\pounds 2^{\wedge}$ to R2f for the native hand-charka. The clean cotton sold for R15 per maund, while the ordinary native was selling for R13-8. The seed could have been sold for Ri-10 per maund, but the price of the clean cotton alone was more than would have been got for both cotton and seed had it been sold unginned. The outturn of • the gin was 18 maunds per day of nine hours. The Karachi Chamber reported, • saw-ginned Sind native cotton from selected seed appears to be a great success. The staple does not show any signs of having suffered from the process of ginning, and is valued at about Ri£ to R2 more than the average native *tattda.'* The hand-ginned samples of selected Sind cotton, *i.e_m*, grown from the selected seed, were valued at Ri to Rij- above the then existing average selection of Sind. It is noticed further by Mr. Strachan that the saw-gin does not crush the seed, and that the percentage of clean cotton is greater than that obtained by hand-cleaning.

1886-87.—"The Dha'Wa'r Factory is languishing. Perhaps the defeneration of staple in the exotic cotton is the cause. The extra pr>ce oes not encourage or repay the use of the rather expensive gins. Private enterprise has not, as was hoped, relieved Government of the necessity for maintaining the factory. It has been decided, however, that if the Local Boards will not take over the factory, they will be closed on 31st August 1889. By this time the newly-imported seed may alter the prospect of affairs.

"This gin is wonderfully appreciated in Sind for indigenous cotton. It is only used in Dha'rwa'r for exotic. I have in former reports given details of the working in the Sind Farm. Saw-gins were exhibited at the Shikarpur Show and were much liked. But a further indication of approval must be recorded. A large cotton dealer at Hyderabad, Sind, has contracted with the Government farm to gin considerable quantities of cotton with the saw-gin driven by the farm engine. The result of this working is not yet known."

ANALYSIS OF LAST YEAR'S TRADE.—The total imports into the Bombay Presidency in 1888-89 amounted to 457,470 cwt., of which 119,949 cwt. came by rail, 287,553 cwt. by road, and 53 cwt. by coast, from external blocks; 47,900 cwt. by rail and 1,925 cwt. by coast, from Bombay port. The largest amounts received by rail were from the Central Provinces, Rajputana, Central India, and the North-West Provinces and Oudh; by road, from the Nizam's Territory.

The exports amounted to 3,427,184 cwt., of which 3,372,925 cwt. went to Bombay port, a few cwt. only going to Madras, the Madras seaports, the Central Provinces, Berar, and Bengal. Of the total exports by rail to Bombay port (2,130,897 cwt), Khándesh, Násik and Ahmednagar contri-

G. III

Cotton Sholapur, 208,1	
	cwt., Gujardt and Káthiawár 694,080 cwt., Poona and 12 cwt. _f the Southern Mardtha Railway, 148,005 cwt., tnd of Narbada and below the Gháts, 102,883 cwt, and tle Rock, 3,631 cwt. The largest importing areas by. rai nd Kdthiawár, the region south of Narbada, Khandesn nednagar.
ULTIVATION	2. SIND.
In	es. — Stocks, Rep. on Sind; Gazetteer, io _t 13, 101-102, 169, ¹ 9 ² >
112 426>475	$5,520,52r, 559,603,654,694,74t > *os_t \& 5r_m$.
REVIEW OF 7	THE AREA, &C.—Sind shows a steady increase in the ar 00 no cultivation, the annual average having risen from 57 the
113 acres in the ten	years preceding to 65,600 during the past decade, ror
last five years t	he average has been 73,000 acres. That this increase ap
	dy and continuous is shewn by the area for 1888-89, which
	s. The total outturn indicates a corresponding increase, an r consideration is returned as 184,200 cwt. for the Britis h -dis
tricts, and 5,400) for Native States, making a total of 189,600 cwt. Thes
	average outturn per acre of nearly 220ft), a very much
larger figure that	an that returned for any other locality. ports amounted to 147,950 cwt., leaving, when deducted
from the outfur	rn 41 650 cwt as available for local consumption – ^
divided by the	population, gives the amount locally consumed as $^{1}9^{\circ}$ P ^e
head, equivalen	it to little under 9 yards of cloth. This figure cannot, how
an arrange of t	the last four years gives only is oco cut as annually avai
able for local co	onsumption, an amount equivalent to 0.71b of local course
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able for local co per head. The above f	figures, liable as they are to most of the errors $P_{f_{t_{t_{t_{t_{t_{t_{t_{t_{t_{t_{t_{t_{t_$
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Sind.

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the world, would seem to be an increased length of staple and greater cleanliness. These improvements, it is believed, might be effected by more careful attention to the culture of the plant, and to the picking and cleaning of the wool " • « . , . , . , . - »

Even so early as 1839 we "find the cotton of Sind referred to by Sir Edward Ryan as a very flourishing phnt, " cultivated in Upper Sind with great care by the aid of irrigation from the Indus."

Like most other commonly cultivated Indian cottons, that of Sind appears to be G. Wightianum, *Tod.*, or hybrid forms of that species. The hybrids are extremely variable, tending to reveit to G. arboreum, and, in doing so, to deteriorate and give rise to local races with marked differences in quality of staple. Thus, the Superintendent of the Experimental Farm at Hyderabad writes:--- During the past season I have had a better opportunity, than ever previously, of comparing the cotton grown in different districts of Sind when it was brought in for ginning, and from no district did I see cotton so good as that grown on the farm from selected seed. This fact, I believe, is generally admitted. The Tanda cotton is best for length of staple; Hála comes close to it for length, and tops it for outturn of clean staple to seed; from the other districts the cotton is inferior to these. The poorest of all comes from Jhudda, in the Thar and Párkar districts. The seeds are smaller than those of the Sindi proper, but much more numerous, while the covering of cotton on them is very short and very thin. Thisyear some of the farm-selected Sindi cotton has been sent for trial in the Thar and Fárkar district, and I trust it will give such satisfaction as will induce the Deputy Commissioner to call for more of it next year." It may be noted in passing that the experiments at Hyderabad seem to have been attended with an unusual amount of success, most of which appears to have been due to the evident appreciation of native cotton on the part of the management of the farm. By careful selection of the best seeds, and attention to the best methods of cultivation and cleaning, a very exceptionally large outturn of a good fibre was obtained, which sold at $\pounds 2$ over the market rate, and which, at the same time, yielded good seed that could be sold for R2 per miund. There can be no doubt that the distribution of such seed, sold at only a little over the bazir rate, would greatly improve the cotton of the province generally.

Conjointly with these laudable endeavours to improve the local races of cotton, numerous experiments were conducted with the object of determining the suitability of foreign seeds lo the climsie and soil of Sind. The result of these has been to prove that no seed can in any way compete, under the local conditions of soil and climate, with the commonly cultivated Sindi race. Bourbon cotton, the exotic chiefly experimented with, gave a crop of only 3i6fl> in one case, 152ft in the other, of seed or uncleaned cotton to the acre. Native cotton, on the other hand, yielded, in the same year iwith similar care in cultivation), 1,775ft of uncleaned cotton to the acre.

SOIL, MANURING, AND METHOD OF CULTIVATION—The following account is extracted from the *Sind Gazetteer* : "Cotton is cultivated in two *ways*—*sailabt* and *bosi*. The first requires frequent watering after being planted, and the seed is sown on the sides of ridges after the surface has been inundated, the holes being made at a distance of about a foot ard a half from each other

"The second description is sown on the surface of the lands left by the inundation; no alter-waterings are required, the dew. which falls heavily, affording sufficient moisture. The only care required is to keep the earth about the stems loose and free from weeds. Cotton is sown in Upper Sind at the end of February or beginning of March, sometimes in May or

{Watt & Munay.) GOSSYPIUM.

GOSSYPIUM. Cotton Cultivation in CULTIVATION June, and picked in July and August, also in November and December. After picking, the cattle are turned in to graze, and the crops left for a SIND. second year. Cattle dung is used as a manure in the proportion of about Method. 12 maunds to a bighå. In other parts of Sind, cotton is not cultivated till the canals fill in June, and the crop, *m* consequence, is not picked till November or even December. The crop is liable to injury from bug" (? cotton-borer), "frost, and locusts." The rainfall of Sind, as is well known, is excessively small, so the greater part of the cotton, as of other crops, is cultivated by irrigation. Watering is effected by what is called charkhi' or wheel irrigation. Cultivation at the Hyderabad Experimental Farm has proved that, to ensure a good crop, (1) rotation ought to be kept up; (2) sowing ought to be broadcast, and should be carried out before the end of June. It was also proved that late cotton is very liable to the attacks of g. een fly in October. CLEANING—Is, as a rule, performed by the ordinary native charka, Cleaning, which is similar to that described elsewhere. Recent experiments have 117 proved that Sindi cotton is easily and more cheaply cleaned by the sawgin than by hand; that the percentage of cleaned cotton so obtained is greater, and that the produce fetches R2 per maund more than the market rate It appears undoubted that the introduction of saw-gins, together with the efforts to improve the stock by careful selection of seed, may do much to improve the quality of the Sindi cotton of commerce. ANALYSIS OF LAST YEAR'S TRADE.—With the increase in importance of Slnd Trade. Karáchi as a commercial centre, the trade in cotton from the province has 118 undergone a remarkable increase. Sind formerly imported the cotton it required, to the amount of thousand* of cwt annually, principally from Kachh and Gujarat, indeed, it was not until 1840 that the plant began to be at all extensively cultivated in the province itself. The fibre at first held a very -poor position in trade, and in 1863 shewed a difference in value as compared with "Fair Dhollera" cotton of from \d. to 6d. per pound. In 1870, it had so far improved as to reduce this difference to *id*. or ||d. In the year under consideration (18S8-89), ^{t n e} average value of the exports per cwt. amounted to over R20, an amount almost equal to that obtained for the average cwt. of Bombay cotton in the same year. The outturn has steadily increased, until last year, as already stated, it reached a total of 189,600 cwt' The imports amounted to J7, ojq cwt., of which nearly the whole, vis,, 74,012 cwt., was derived from the Panj£b, the small remainder came from the port town of Karáchi, and trans-frontier from Lus Bela, Khelát, and by the Sind-Pishin Railway. The exports amounted to 224,927 cwt., of which a small amount went to the Panjab and trans-frontier to the localities above-named; all the rest, viz., 224,330 cwt., was sent to Karachi for shipment. **CULTIVADON** 3. BERAR. in References.*"Rivett-Carnac, Rep. on Operations of Cotton Dept, 1867-1869; Annual Reports, Cent. Provs. and Berar Cotton Dept.; Hume, Note on Cotton in Berar (1885); Official Corres. and Reports; Agri.-UorU BERAR. IIQ Society of India, Jours. (Old Series), XI._x 456, 472; XII., 22-29! (New Series), I., Proc, Ixi. REVIEW OF THE AREA, &C.-This province, after Bombay, has the Area. largestarea under cotton; but, in comparison to the total cropped area, the 120 fibre is grown much more extensively in the latter than in the former tract. The cultivation of cotton in Berar reached its maximum in 1878-79, when as much as 2,207,839 acres were planted, but two years later a minimum,

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•	•	Berar.	(Watt & Murray)	GOSSYPIUM.
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for the last fourteen years, of 1,755,046 acres was recorded. Since that date it has again gradually increased, and, in the year under consideration, attained 1,991,551 acres. Reference to the table, p. 56, will show that the total outturn in the same year was 1,276,061 cwt. of cleaned cotton, an average of 71'68ft) to the acre. Comparison with similar figures for 1887-88 shew a very marked increase in the production per acre, the total outturn in 1888-89 being nearly double that of the former year, while the area increased less than 100,000 acres. By a similar calculation to that followed in the case of Bombay and other regions, the total amount available for consumption in the year under consideration, is found to have been a minus quantity of 48,448 cwt. This fact is only to be explained by the absence of registration of road traffic, and by the error which necessarily arises from considering statistics for on[©] year only. On this subject the Commissioner of the Hyderabad Districts writes:—

*' The replies received from Deputy Commissioners shew that information as to imports and exports cannot possibly be given, as there are no statistics of road-borne trade in Berar. Information on consumption and outturn is included in the statement under submission, but the figures are only approximate. It is difficult to come to any conclusion as to the consumption of indigenous cotton per head of population, as no attempt has yet been made to ascertain what quantity of cotton is reserved by cultivators and others for local consumption. In the Amraoti district the consumption is estimated at one-tenth of the outturn, while in the Basein district the proportion, which estimated consumption bears to outturn, is 1 to 32. With such estimates arrived at by tahsildars, the figures must certainly be untrustworthy."

The Deputy Commissioner of Amrdoti, commenting on the grave error which must arise from want of road trade returns, writes :—" The figures of yield and consumption given above are for Berar, but in addition cotton is poured into it on all sides from the Central Provinces an&the Nizam's Territory. In Amrdoti district alone the cotton markets of Amraoti, Dattapur, Karinja, and Murtizapur receive annually thousands of hundred-weights of cotton from the Nimar, Wardha, and Chanda districts of the Central Provinces, and from the Nizam's territories south of the Paingunga river, Rajur, Ealabad, Bela, and, perhaps, even more western taluks."

The exports from Berar, on the other hand, go principally to Bombay port for shipment, and are consequently nearly, if not quite entirely, represented in the rail-borne trade statistics.

With such an error in the available trade-returns of the province, it is obviously necessary to arrive at an estimate of the local consumption by some other means. This has been done in the recent note on cotton, supplied to the Government of India, from Berar, by accepting the estimates of tahsildars as approximately correct. These, though not as absolutely correct figures, may perhaps be accepted as fair approximations to the truth, and shew that the average in the year under consideration was 4ft per head, indicating a total consumption of 103,725 cwt. This large amount, however, leaves only 1,172,337 cwt. to meet the net export of 1,324,482 cwt. The road imports alluded to must, therefore, have been over 150,000 cwt.

It appears probable, however, that the above estimate of 4ft of cotton per head may be considerably in excess of the truth. The figure is certainly a very large one in comparison with that arrived at for other provinces, and is commented on, as follows, in the recent report above referred to : "The Deputy Commissioner of Ellichpur is of opinion that

GOSSYPIUM.

Cotton Cultivation in'

BERAR.^ Area. Chief Districts. I2Z	"is probably due to the fact that the richer than their neighbours of the Cer the whole, a less fertile country to li consume cotton and other products of Berar Kunbi does; but the Resident fee difference may be due to the figures bei DISTRICTS WHERE GROWN.—The va- has been estimated, cotton occupies as vated area, is the locality where the b rich black soil, sometimes extending to mostly in the Akola and Amraoti distri of Khamgaon, the centre of the cot portion of the Buldina district. The Khamgaon, Akot, Shegaon, &c. at w situated in the same lowland country; to these large emporiums, as petty deal at every substantial village, weekly m throughout the province. In the case ready sale for their produce, since th which act as feeders leading either to th large marts. The comparative share taken by e extensive cultivation will be seen from t	itral Provin ive in, and the soil to t els bound to ng based on alley of the" much as 40 est cotton i 30 or 40 fe cts (the forr ton trade), large tradi hich places but cotton ings take pla narket, and e of distant ne country ne nearest ra ach district	ces, &c, wh consequent he same ex- say that H the merest Payanghd per cent, o s grown. et in dept ner includin also in th ng towns of there are H trading is ace, during even railw towns the possesses g ilway, or to	ho have, on htty, do not ktent as the he fears the t guesses." t," where.it f the culti- Here, deep h, is found ng the town he northern of Anr«/aoti, presses, are not limited the season, vay station, rayats find good roads, pone of the
	DISTRICT.	Area unde	er Cotton.	Total out- turn ot Cot- ton cleaned.
	Antráoti Akola EUichpur, excluding Melghåt • • Melphåt Buldána Wun Basim	Unmixed. Acres. 139,272 431.226 194*397 4.312 258,340 131,942 230,672 1,390,161	Mixed. Acres. 363.038 5>>>>502 12,833 249 55.199 118,569 ••• 601,390	Cwts. 296,004 228,590 101,152 3. "69 348.126 204,280 94.740 1,276,061
Raees. 122	RACES OF COTTON IN BERAR—The mercially as <i>Oomras</i> or <i>Amrdoti</i> (bet Like <i>Hinganghdt</i> , however, it in realit known by the same vernacular names cultivated, for the most part, towards th deep black cotton soil of the low-lying of is pretty much the same, but since <i>jari</i> to seed, and has a stronger, though sho it is preferred by the cultivators. As alre forms of G. Wightianum, <i>Tod</i> . In 18 sent to India to cultivate cotton, report more nearly right in their method of c India ; the cotton is good and only make it a most desirable article." Mr. Hare, Settlement Officer, Yeot gave the following interesting informa G. 122	ter known a y consists o of <i>bant</i> and le Southern districts. Th yields a lar orter and coa eady stated (842, Mr. Me ed of Amra ultivation th requires mo mal, in a rec	as <i>Oomrawa</i> f two distin d <i>jari</i> . The Ghâts, the he average y ger proport arser, staple see pp. 64,1 rcer, one of aoti:— ^{if} The lan in any of ore care in cent letter to	<i>attee</i>) cotton. And the content of the second sec

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CULTIVATION Then came the shortin •BERAR. Races.

(Watt & Murray.)

"Akote used to be famous for its jari. district: stapled houri which, being a heavy cropper, partially displaced the *jari*. In the last two or three years both have been replaced by a new variety called kateli, from a thorn on the seed*, which is much more profitable to sow than either of the others. This is probably a hybrid, and, if so, an attempt might be made to improve it still further, as the staple is not good. The cultivators have not the slightest idea where it came from." The remarks about a new variety threatening to displace the famous Jari cotton of Berar is of interest, and it is to be feared that this *kateli*, from the poorness of its staple, may be productive of much harm. Specimens have not been received and consequently the authors are unable to determine the botanical nature of this race. It seems possible, however, that it may be either a form of Vilayti-Khdndesh, which is known to be rapidly spreading 3n Berar, to the certain detriment of the once famous staple of that province, or the "Dhirwar" cotton referred to below. Dr. Hume, in his note on cotton (1885), describes three additional forms to *bani* and *jari*. The first of these is a *rabi* crop of *jari*, grown at the same time as wheat, and picked in March and April. It is sown on marshy and water-logged land, which, though quite uncultivable during the rains, retains water, and is thus available for cultivation in the cold weather. The soil is rich and deep, and supplies the cotton with water well into the hot weather. The crop, however, is not so heavy as that of kharif jari.

The second form is "Dhdrwar," an acclimatised American cotton. Dr. Hume describes it as follows: — The staple is rather shorter than that of the usual cotton. It is not grown as a separate crop, but plants of it appear at intervals in a cotton field. The natives call it 'gogli jaris' the *large jari* or large-seeded *jari*. As a market cotton it has no separate existence, owing to the small quantity of it grown and the admixture of it with other cotton during the picking of the crops. Since the merchants have made such a determined stand against the Khandesh cotton, this American cotton is becoming more extensively cultivated than it ever was before.'

The third breed is Vilayti-Khdndtsh, which, according to Dr. Hume, came to Berar, principally because the Collector of Khindesh forbade its cultivation in his own district. He adds:- '• The Khandesh variety is being grown largely to the ousting of the other varieties, and the most certain ruin of the Berar cotton trade. At present they obtain from Vilayti-Khdndesh* an early crop, also a large one, getting three or four pickings instead of two or three as they get from the indigenous cotton. They receive R3 or R4 a bale less in price than for the indigenous cotton, but the greater bulk compensates, and much more, for this small loss. Hut this apparent prosperity will be short-lived, for it is only by mixing this Vilayti-Khandesh cotton with the indigenous cottons that merchants get it accepted in Bombay, and mixing cannot be carried to a greater extent than a third of the quantity with bani and a much smaller proportion with jari. When this Khandesh cotton has succeeded in ousting the bani and jari, there seems every prospect of extensive distress and ruin. The Khdndesh variety is getting better than it was when first introduced, according to some people; but however good the Khandesh may become by hybridisation, it can never be as good as the old jari and bani; any hybrid of Khdndesh must be a deterioration on them."

" It is a coarse hardy plant, that will grow almost anywhere that cotton will grow, and produces a large crop; but the staple is short and Vilayati-Khandesh. Conf. with pp. 58, 75.

^{*} The seed of most forms of **G**, herbaceum proper is beaked Con/, with p. 27.

f It seems highly probable that Vilayti'Khdndesh or Varadi is a hybrid form, very probably derived from G. herbaceum var. microcarpum on G. neglectum! The authors, however, have not seen an authentic botanical specimen.

BERAR.

Races.

Cotton Cultivation in

CULTIVATION hard and is objected to as cotton in the home markets, and consequently in Bombay. It is a bad variety, and is doing a lot of injury, by its cultivation in Berar, to the Berar cotton reputation. The plant looks 'jungly;' the high split leaves show want of breeding and cultivation, which is borne out by the short-stapled fibre."

The following history of the attempts to extirpate the Velayti-Khdndesh in Berar is of interest, and may be quoted in entirety horn the Note on Cotton issued by the Revenue and Agricultural Department, Government of India :-

' This inferior cotton formed the subject of correspondence between the Resident, Hyderabad, and the Government of India in 1883-84. The Resident, Mr. J. Q. Cordery, reported in August 1883, that vigorous measures were adopted in 1875-76 for the extirpation of this variety (Vilayt*)* which possesses no staple but is a very prolific crop, costs less to pi aduce, and is clean and good to look at, an3 is, therefore, largely used for purposes of adulteration. It was added that the admixture had of late years been in some markets carried too far, and that it was apprehended that unless its growth could be discouraged, the reputation of Berar cotton would be much injured. The measures taken in 1875-76 were successful for the time, and proved, it was said, permanently successful in Khan-desh. The cultivators who possessed adulterated or inferior seed were induced to receive in exchange for it seed of the same indigenous variety. Advances were made in Berar for this purpose amounting to R 18,000. It does not appear that the agriculturists were compelled to accept the proposed exchange, but a special officer was deputed to the work and much attention and enquiry was needed for its successful execution. It was stated that the reason why the success was not permanent in Berar was probably the fact that, in January 1878, instructions were issued by the then Resident, Sir R. Meade, to Deputy Commissioners that no future attempts should be m.ideto control cotton cultivation, and hence A was supposed by the growers that (iovernment had become indifferent about the matter. The evil was said to have spread to the Amr&oti district. Mr. Cordery was inclined to return to the policy formerly adopted, and he, therefore, asked sanction for another advance (R 15,000) to purchase the seed required for the elimination of the vilayti seed from Berar."

To this application the Government of India replied in 1883 as follows :

" I am directed to acknowledge the receipt of your letter on the present prospects of cotton in Berar and the increasing extent to which an inferior staple known as vilayti, and originally introduced from Khandesh, is being grown by cultivators. You refer to the measures adopted in 1875-76 in Berar, and previously in Khandésh, for the extirpation of this variety of cotton by the distribution of superior seed, by money advances, and by executive orders. And you consider that, though these measures produced no permanent results in Berar, and were abandoned in 1878, yet the large interests at stake, and the success which attended similar measures in Khdndesh, justify further efforts in Berar You accordingly solicit[^] the sanction of the Government of India to the expenditure of Ri5,000 in'advances for seed, of which sum you are disposed to think that not more than one-half might be recovered by Government.

" In reply, I am directed to say that, after giving the subject of your letter its careful attention, the Government of India has come to the conclusion that any attempt on the part of the State to make the Berar cultivator grow one class of cotton when his immediate interests prompt him to grow another, is almost certain to end in failure. The measures taken in G. 122

Berar.

(Watt & Murray) GOSSYPIUM.

Khandesh have not been permanently successful any more than in Berar. CULTIVATION The steps taken by Mr. Ashburner in 1876 succeeded at the time, but as soon as the vigorous measures to which he had to resort ceased with his departure from the district, the cultivators of Khdndesh returned to the inferior variety of cotton. Writing in 1882, Mr. Propert, the Collector of Khandesh, was obliged to confess that all his endeavours during six years of office to discourage the cultivation of the inferior cotton had been practically fruitless.

Under these circumstances, the Government of India, before sanctioning any expenditure on the purchase and distribution of seed in the Berars, would like to be assured that there is some probability of the experiment being productive of more lasting results than have been achieved hitherto. If there is any difficulty in procuring good seed, the Government of India will not object to the institution of any agency for obtaining and distributing it. But the Government of India is unwilling, in the face of past experience, to countenance a system of advances year after year on the mere chance of the cultivators of Berar being thereby induced to abandon the cultivation of a description of cotton for which they have shown a decided preference. Indeed, it appears to the Government of India that it has yet to be shown that the cultivators are wrong and do not know their own interests best. The short-stapled cotton appears to possess certain advantages in regard to soil and climate over the long-stapled variety: it is said to require less rain, and the facts seem to indicate the possibility of greater economy and profit in growing it. These are points which appear to the Government of India to deserve investigation, and I am to suggest that they might profitably form the subject of a series of experimental trials (which should from year to year be carefully watched and the results recorded) in a limited area or in a small number of villages. Proof cannot but eventually be forthcoming as to which cotton returns most profit, and it is by the test of the profits to be derived, rather than by any action on the part of Government that the cultivator will be influenced m his selection of staples."

Mr. Cordery in October 1884 again wrote as follows:—

"1 have the honour to forward what appears to me to be a careful and able report from the Officiating Commissioner upon the manner in which the Province of Berar is affected by the large and increasing admixture of an inferior variety of seed with that which produces a longer staple of cotton.

" If, as Mr. Ridsdale asserts, the new crop has created a market of its own with a designation known in Liverpool and commanding a sufficient profit, there can be no need for any action whatever. The question has, of course, been represented in a very different light by other officers; but the conclusions drawn by the Officiating Commissioner would appear to be more in accordance with the probabilities deducible from the recent extension in the growth of this variety than those based on the statements of traders disappointed in not finding the better variety which they desire to purchase. In such cases the term adulteration is not truly applicable: there is no concealment on the part of the cultivator, and the buyer is not ^deceived. The substitution of an inferior staple for one which formerly ^deceived. "enjoyed a better reputation and a larger price must, under these circumstances, be held to be due to natural causes, against which it is useless to contest.

••The suggestions, therefore, made in my letter No. 368, dated 17th August 1883, were based on the mistaken belief that the complaint lay against an adulterated article being brought to a market, which (if this course were persisted in) would ultimately be closed to Berar. And on the fuller information before me, I have no desire to press them further.

In BERAR.

Races.

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	Cotton Cultivation in
CULTIVATION BERAR. Races.	 The Government of India replied that it agreed with the Resident that a case had not been made out for State interference. "In the Land Revenue Administration Report on Berar during J386-87 it is mentioned that <i>vilayit</i> cotton is fast driving the old <i>bant</i> cotton out of the fields to the great grief of all cotton merchants who like <i>bum</i> because of its long staple, which fetches a higher price than the shorter staple produced by the hardler plant. The large introduction of the latter around Amrafoti is stated to have caused the present cotton known as <i>umras</i> to be looked on as very inferior to what it was a few years ago. It is asserted that the reasons for its superior popularity are, besides its extra productiveness, the fact that the plant is not so easily injured by either excessive wer or drought: it is an earlier crop, and does not come into bearing all at once. These facts have been proved from experiments carried out for some time now on the Amrafoti Experimental Farm. The Deputy Commissioner of Amrafoti considers it necessary to endeavour to substitute, if possible, a variety combining the hardihood of the <i>vilayti</i> with the long staple of the <i>bant</i>, and he suggested that Government should obtain the services of a scientific agriculturist to see if anything could be done towards this end. The Commissioner, in remarking that the suggestion was a good one, added that the value of the profuct was sufficient to warrant the expenditure of a large sum in making such experiments, and supported the proposal met with the approval of the Government of India, the advice of Mr. Ozanne, Director of the Agricultural Department, Bombay, was solicited, and seed was obtained from that department for issue to the <i>rayats</i> in 1888. ⁹ It is to be hoped that these efforts maybe productive of good in exterminating the inferior exotic breeds which, during the past few years, has been steadily obtaining a stronger hold on the agriculture of the prounce, air j at the same time ousti
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·	Berar.		y.) GOSSYPIUM
by experience will doubtless	-	mass of prejudice still t	<u> </u>
when the use and advantage o	f thorough manuri	ng will be generally un	JBttKAIE.
stood by even the <i>rayats</i> in the			
The manure generally use			
the villages by daily contributi	ion from each hous	e. Various other manu	ires,
such as poudrette, guano, and	d bones, have bee	n tried, and are even	now
employed in some exceptiona			
lage dust-bins. Even this, h			
soils, as the rayats are of the			
manure with water does very			
excellent, but, should rainfall			
citing the plant and driving it t			
^ROTATION.—Mr. Hobs is 1st, wheat; 2nd, Lathyru			
practicable); 5th, <i>jowari;</i> 6th			
that, except in the Buldana			
and jowari has decreased, hav			
which the <i>rayat</i> has found it	more profitable i	in every way to devote	his
ground. The cultivation of b	both last-mentione	ed crops, however, requ	ires
a considerable amount of mar	nure, and since th	e soil is given rest by a	con-
stant rotation, the cultivator fi	nds it indirectly to	his advantage to conti	inue
cultivating cotton.			Accordent
ASSOCIATED CROPS.—Too	or (Cajanus indicus) in the proportion of c	one- Associated
tenth is-generally associated =	vith =cotton; =but=ir	n=the=vilisiges to the se	with 125
and above the Ghats bajri an Sowing, PLOUGHING, R	HADING &	r. Hobson -writes 49	The Sowing. &4.
method of cultivation is rude	and simple : deer	ploughing is but ra	ely 120
resorted to, the rayat consid	lering (possibly wi	th some reason) that	the
power of the sun would seen	burn nut all the	actifishment that might	
in the soil.Cotton, as before	mentioned, is sov	wn in rotation^and in	*he
deep black soil of the valley g	<u>generally succeeds</u>	Lathyrns satives. Be	ing
an autumnal crop, the seed is	sown in the early	part of June as soon	<u>as</u>
possible after the first fall of 1			
The surta, which is a roug	r <u>description of c</u>	mu plough, is chieffy u	<u>sed</u>
when sowing cotton. Then po	AURIA OF SCOL IN C	onsidered, suitelent for	
acre of land; some soils, less quantity of seed The cotton b	productive than 1	the Diack, require a lar	
further until the weeds have	cronned un Th	e <i>dauri</i> a kind of scari	ren
	cropped up. In	ie adani, a killa oli seall	
up the weeds and loosening	the earth and t	hrowing it up round	the
pl ants. Women are now sent	in to gather up th	e roots [*] whl ch may hap	pen
to be on the surface of the	ground. They al	so tan the vourse nis	andar
where they happen to be too weeded depends upon the res	thick. The nur	nber of times the field	15
weeded depends upon the res	ources of the cult	ivator, some having th	
fields weeded three or four tim			-1
Picking commences in	November, and pr	operly weeded and car	eq
por^^ <u>opsyieiQ^nree^aTneTin_</u>	A; when bloked it	is carried ro the thresh	iiigi
hoors, or enclosures specially I the stack is completed, the ov over it, in order to detect any	prepareo		
LIC BLACK IS CUIILING, THE ON	tampering Wei	s rong ways and Grosswi whing would be a set	ays
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process, that which he follows	is much simpler s		
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the sanctity of being a time ancestors. The cultivators ha	-honouced custom	banded down from s predilection in favou	his
process, that which he follows the sanctity of being a time	-honouced custom	banded down from s predilection in favou	his

GOSSYPIUM. Cotton Cultivation *lA* CULTIVATION The above remarks refer to the finer form of cotton known as bant. BERAR. Jari is cultivated, in much the same way, but is sown some fifteen days later, and takes longer in coming to maturity, so that the first picking seldom comes off before the 15th of December. Injuries. INJURIES.—Mr. Hobson writes to the following effect: «^c Cotton requires 127 rain shortly after sowing, otherwise it does not germinate; on the other hand, if there is too much rain, the plants rot. Should it rain during Swatt Nakshatra, i.e., the dark quarter of October or the beginning of November, it is generally supposed that the crops will be seriously injured. The natives have a proverb, «Pad6 swatr kapus na mile" wati/ which, freely translated, means, 'should it rain during swati, you will not be able even to get cotton for wicks." "The bolls are subject to attacks from insects (cotton-borers), and a promising crop early in the season thus not unfrequently ends in failure and disappointment. White-ants, too, sometimes attack the plants, but, as a rule, the cotton is a hardy plant, and, given a fair monsoon, there is little to fear.' CLEANING.—The instrument employed in cleaning and separating the Cleaning. fibre from the seed is called *retsa*. It is similar to the *charka* elsewhere 128 described (p. 115), consisting of two horizontal rollers, one of which is sometimes iron, but usually both are of wood. Generally, this is of such a size that it can be worked by one woman, but a larger kind is occasionally to be seen which requires a woman at each end to work it. After being cleaned the cotton is scutched. This process is somewhat peculiar, and is described as follows by Mr. Hobson :---" The scutch, called *Kamdn*, is a wooden instrument about 3[^] feet in length, embellished at each end with traditional signs and carvings. To the kamdn is attached a bow-string made of sheep-gut, termed *tdt*. Scutching is termed dhunkna, the person who works the instrument, pinjdri. Having fixed one end of the kamdn to a beam with a string called dhani, he seats himself with the loose cotton in front of him and the *tdt* resting on it. He then passes his left arm through a roll of cloth called hdthd, which goes over his elbow and gives him a purchase. With the left hand he holds a piece of stick called *dhunduri*, which is tied to the *kamdn* to steady the whole instrument; with his right hand he takes a kind of elongated dumb-bell called *dastara*, the end of which he catches in the bow-string, and constantly twangs the latter. This causes the *tdt* to strike the cotton at each twang, thus separating the fibres. The floss, by this process, becomes loose enough to be subsequently twisted by women round pieces of wood, forming spools called These are afterwards worked into spinning thread." nelu. YIELD PER ACRE.—" AS already stated, the average yield per acre for Yield. 129 the year under consideration, as derived by dividing the total outturn by the total acreage, was 71*688)." The following figures, however, subject to the errors indicated at pp. 53—54 & 87, are given as the actual outturn in each district:-OUTTURN PER ACRE OF CLEANED COTTON

DISTRICT. Unmixed. Mixed. ft ft **5**3 Amraoti 66 Akola 26 49 Ellichpur 49 58 • Melghat **4**0 So Buldána 28 72 32 Wun *9*0 Basim 46 ...

G. 129

Berar.

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G. 131

{Watt & Murray.) GOSSYPIUM, The outturn per acre shews a very large increase over that of the CULTIVATION In BERAR. previous year, perhaps due, in part, to the increased cultivation of inferior but more productive races *{cff.* p. 92). COST AND PROFIT OF CULTIVATION.—Mr. **Hobson** writes, "Preparing, sowing, and weeding cost on an average R7 an acre, but much depends, of course, on the district, and whether sufficient hands are Cost of, 130 obtainable when wanted. Some small farmers sow a much larger surface than they can afford to use and clean properly; the crops naturally are poor, and the owner becomes disgusted and consequently careless of

saving even a portion of his crop. Such men are said 'to try a large mouthful, having only a small mouth,' "Picking and Weeding are heavy expenses; the cotton-pickers are not paid in cash but in kind; the rates vary according to the market, the average may be said to be one-tenth of the first picking, one-sixth of the second, and one-third for the third, equal to from R3 to R4 an acre. Separating the fibre from the seed by passing it through the *retsa* is paid for, sometimes in kind, to the value of annas 5 to 7 per maund (28IB) of seed cleaned, which equals R2 to R3 an acre. The total cost may be taken at R13 to R15 an acre, depending greatly on the district, leaving the cultivator a fair margin of profit. This, of course, again depends on the demand.

"Kapds when cleaned gives 26 per cent, of cleaned cotton. Besides the cotton, the cultivator has the cotton-seed, sarki, to feed his bullocks upon, and cotton stalks, which are used for numerous purposes, such as roofing grain stores, &c, but cotton is not the crop the ray at now pins his faith on; it is being driven out of the field by the more profitable cereals.'

PRESSING AND PACKING.—In 1866 there was not a single cotton press at work in Berar, at the present time there are said to be 31 such presses. (Indian Cotton Statistics.) The following description of these presses and their effect on the cotton trade of the province may be quoted from Ahe Berar Gazetteer:-

But it was the introduction of pressing that promoted as much as, or more than, any other reform the safe and expeditious consignment of our inland cotton to the seaport. In 1866 there was not a single cottonpress at work in Berar, though it seems that as early as 1836 Messrs. Kikaji and Pestanji, merchants of Bombay and Hyderabad, had set up one screw at Khamgaon. During the year 1867, thirty-two half-presses and two full-presses were set up, and the subjoined statement details subsequent progress:-

		 	TEARS				Full-Presses.	Half-Presses.
> ⁸⁶⁸	•	•		-		•	14	81 125
≪869 ''870 = >					:	:	19 19	125 74

* During the season of 1869-70 the number of half-presses has very sensibly diminished, because the railway rates of carriage have been raised on half-pressed bales to an amount that renders full-pressing very much more advantageous. The effect of this change has been to throw most of t the cotton into the hands of the merchants who buy for direct export to England, since the Bombay market does not like to invest in bales that cannot be opened out for examination of the cotton. Therefore most of

Pressing ft Packing. 13I

.

Cotton Cultivation !n

GOSSIFIUM	· Cotton Cultivation In
CULTIVATION in BERAR.	the cotton sent down in 1870 by railway from Berar has been full-pressed, as the following figures show :• -
Pressing & Packing.	Full-pressed. .122,932 Half pressed. .69,585 Dokras(^). .16930
	3i'cwt., or equal to 104,723 Bombay kandis.
Berar Trade. 132	" In the market of Berar all the cotton is sold, between producer and dealer, by the <i>boja</i> of 280ft, or 266ft nett; about three of them go to the Bombay kandi. The word means generally a load, and in the Berar cotton trade it meant particularly the load of a pack-bullock. "In the half-pressed bale the cotton is condensed to about 12ft the cubic foot, and in the full-pressed bale contains generally 3J cwt., but Kham-gaon presses now usually succeed in getting 3 cwt. within the bale. The half-pressed bale sometimes contains as much as 5 cwt., but then it is nearly three times the bulk of the full-pressed. In these inland districts the dry weather makes cotton so elastic that the best presses find much difficulty in obtaining the density of a bale pressed on the sea-board. " The full-pressed bale and half-pressed bale are equal to about half a Bombay kandi, and the <i>dokra</i> to one-third of a bale." The advantages of full-pressed for shipment at the seaboard. ANALYSIS OF LAST YEAR'S TRADE.—The imports into Berar by rail during the year under consideration, 1888-89, amounted to 8,704 cwt., the exports to 1,333,186 cwt. Of the imports nearly the whole were derived from the Central Provinces ; but Bombay, the North-West Provinces and Oudh, Irtajputana and Central India, and Bombay port contributed small amounts. As already remarked these rail-borne imports represent but a very small fraction of the total, thousands of cwt. being received by road at the great markets of the province from the Central Provinces and the Nizam's territories. Regarding the latter Mr. Hobson wrote in 1887 '• "** former years large quantities of cotton used to come across from that part of His Highness' Dominions, and doubtless the cotton export may return to its former average." Of the total rail-borne exports, 1,290,807 cwt. went to Bombay for shipment, leaving only 42,379 cwt., of which nearly all was exported to the North-West Provinces and Oudh. Very small quantities were received by the Central Provinces and Oudh. Very small quantitie
CULTIVATION in RAJPUTANA.	4. RAJPUTANA AND CENTRAL INDIA.
133	References. —Gazetteer of Raj put ana, 98, 150, 227, 254, 269; Cotton Reports of Rev. and Agri. Dept.; AgriHort. Soc. of Ind. Jour. {Old Series): -/., 27S, 278; 11., {Ft./.}, 62; 111., 257-274- PEVIEW OF THE APEA & C. It is impossible to determine whether the
Area, 134	REVIEW OF THE AREA, &C.—It is impossible to determine whether the area under cotton cultivation in Central India has increased or not, since it is only within the past four years that any attempts have been made to esti- mate it. The outturn and the exports have, however, largely increased, and now supply a great part of the * Bengals * received Tor shipment at Bombay.
	G. 134

Rajputana and Central India. (Watt & Murray.) GOSSYPIUM.

CENTRAL INDIA.

TOTAL

State.

CULTIVATION RAJPUTANA. The average area under the crop during the two years 1885-86 and 1886-87, was returned as 886,419 acres, and the average outturn as 877,607 cwt. These figures show an average yield per acre of nolb. Later figures are not available for Central India, but in Rajputana alone the area in 1888-80 is returned as $45S^{25}$ acres, the outturn es 493,206 cwt. The acreage during that year was less than the average, because the rains were late and less was sown. The yield was also much under the The net exports from Rajputana and Central India in 1888-89 average. amounted to 596,631 cwt., leaving (on the assumption that the crop for that year equalled the average given above) 280,976 cwt. for local consumption, or dividing this sum by the population, *v6fb* per head. This closely corresponds to the estimate of 255,000 cwt., given in the "Statistical Tables." The average outturn in Dholpur is stated by the Gazetteer to Se64ofli of uncleaned cotton per acre.

DISTRICTS WHERE GROWN.—The relative importance of the various States, as cotton-growing regions, is shown in the following table, the figures of which are quoted from Mr. Beaufort's "Indian Cotton Statistics" :-

Gwalior

Bundelkhand

Western Malwa

Baghalkhand

Indore

<u>B</u>hopal

Bhcpawa

Area.

Acres.

.

140,000

120,000

60,000

65,000

25,000

16,000

30,000

20,000

15,000

9,000

10,000

40.000

550.000

RAJPUTANA.

TOTAL

State.

Jaipur Meywar

Ulwar

l*hurtpore

Marwar

Dholpur

Kishengarh

1 hall a war

Minor States

7

Kotah

Bundi Tonk

The above	totals	amount	to a	slightly	smaller	area than	the avera	age
derived from	Gove	rnment re	eturn	s for the	two yea	urs ending	1886-87,	but
correspond s	ufficien	tly to indi	icate	the relat	ive impo	ortance of e	ach State.	

RACES OP COTTON.—All the cottons exported from Rajputana and Central India are included commercially in the group of "Bengals," and are probably nearly all forms of G. herbaceum as that species has been described in the *Flora of British*. India. Numerous references are to be found in the publications of the Agri.-Horticultural Society of India, to a particularly fine cotton called barareea, cultivated near Chanderi and employed in manufacturing the fine cloth called *mahmudL* Major Sleeman describes this fibre ^is coming from Indore to Chanderi, and also as being produced in a few fields in the villages of Herawal and Singwara in the district. He states that" if the seeds of the barareea cotlon be sown in any other fields of that district, the cotton produced is found to be like the produce of the ordinary seed, and to lose all the peculiar qualities of the barareea cotton." In a more recent communication by Mr. Hamilton Bell it is stated, that the imported *barareea* floss is superior to that locally produced. In another article on the subject Mr. Fraser states, that the greater part of Chander Races, **I36**

Districts. 135

Area.

Acres.

120.000

51,000

50,000

25,000

25,000

14,000

290,000

G. 136

5,000

Area.

Cotton Cultivation in

CULTIVATION in RAJPUTANA,	cotton is imported from Berar, and in yet another Dr. Irvine writes that a considerable portion is derived from the Saugor district.
Races.	These statements appear to be supported by the name of the cotton— barareea, and point to the fact that the floss in question was probably the produce of a fine quality of bant, i.e., G. Wightianum, Tod.
1	Several writers allude to what appears to be still another kind of cotton* and very probably G. neglectum, <i>Tod.</i> , as cultivated in Malwa.
Soils.	SOILS AND METHOD OF CULTIVATION.—The soil of Southern Jaipur,
137	Tonk, and Ulwar is fertile though light; that of the extensive plains of the Meywar plateau is fertile when irrigated. In the latter region almost every village has its artificial lake or tank. Behind the retaining embankments, or in the beds, also wherever there are wells, large crops of cotton, wheat, opium, and sugarcane, are raised.
	Localities which are free from inundation are usually selected. The seed is sown in the months of April and June; the first sowings are watered by wells and yield a spare crop; the later depend on rain. Picking com- mences in October and is completed by the end of the year. The seed is sown broadcast, the land is immediately afterwards lightly ploughed, and
	when the crop has reached some height the plough is again drawn in parallel lines. Land thus prepared is said to require little weeding, for the plough furrows deep and removes roots of grass, &c. Weeding which may be required is done by hand, and is again turned up by hand with the trowel or <i>koddli</i> .
	Maize and cotton are the only <i>khan</i> / crops which are manured. About eight cart-loads of manure are applied to the <i>bigha</i> . Night-soil, cow, goat, and sheep dung, ashes, and all sorts of refuse are heaped together near villages, and afterwards utilised as manure. The best kind is the dung of goats and sheep. Fuel being so dear in Rajput- 'ana, cow-dung is only utilised in the rainy season when it cannot be made irtio cakes.
	No definite information is available regarding rotation or associated crops in Rajputana and Central India as a whole. In Dholpur the crop is said to be generally mixed with <i>urid</i> , <i>til</i> , <i>arhdr</i> , and <i>san</i> .
	The following account of the method of cultivating the fine Chanderi cotton may be quoted from Dr. Irvine's article on the subject [Trans. Agri.m Hort, Soc. Ind., VIII., 64). "Chanderi cotton is sown, as usual elsewhere, in June. After the first fall of rain the ground is ploughed, another shower is allowed to fall, when the ground is manured and worked in with the harrow, then again ploughed, after which the seed is sown broadcast and the ground again harrowed, which is nearly the course of the usual cultivation. The seed is then left to spring up under the influence of the rains, when at a moderate height the young plants are carefully hoed, and during the growth the hoeing is sometimes repeated until the matured plant is just about to flower.
	"Should a cessation of the rains occur, then an artificial irrigation is twice or thrice resorted to in September and October. Each <i>bigha</i> requires four people to hoe and do other requisite labour. The result on the same land is by no means equal—some <i>khêts</i> are five times gathered and some seven times. The cotton fit for <i>mahmtidi</i> is never collected oftener than three times, the remainder is common."
Cleaning. 138	CLEANING.—The ordinary <i>Bengals</i> cotton of Rajputana and Central India is cleaned by means of the native gin or <i>charka</i> . Chanderi cotton, however, when destined for the manufacture of the fine muslins of that district is said to be entirely cleaned by hand-picking,
	G. 138

Rajtmtana and Central India. (Watt & Murrav.) GOSSYPIUM.

CULTIVATION COST AND PROFIT OF CULTIVATION.—The following figures, given in RAJPUTANA, in the Raj pu tana Gazetteer for D hoi pur, may also be accepted as fairly COST-& a. p. Cost.

Ploughing".							.•	i 8 •	139
Mommo	•	•	٠	•	•			0 11 0	157
Seeds	•	•	٠	•		•	•	083	
Weeding	•		•	•	•	•	•	3 12 0	
Picking	•	•	•	•	•	•	•	660	
Cleaning	•	•	•	•		٠	•	0 11 0	
Wear and T	ear	•	•	•		•	٠	0 3 6	
Rent .	•	•	•	•	•	•	•	11 4 0	
						TOT	AL	<u>25 _{0 0}</u>	

The^alue of the cotton crop may be put at R26-10-9, the other grains R7-6-9, seed after cleaning R1-4-0, total R35-5-6, showing a profit of R10-5-6.

ANALYSIS OF LAST YEAR'S TRADE.—The exports from Rajputana and Central India are increasing yearly; in 1885-86 they were only 399,285 cwt., while in 1888-89 they amounted to 600,411 cwt. The greater part is received by Bombay port, which derives much the largest proportion of its "Bengals" from Rajputana and Central India. The imports from these States into Bombay by rail during the five years ending 1886-87 averaged 387,000 cwt.; in the year under consideration they amounted to 497,311 cwt. Of the remaining exports, 23,136 cwt. went to Calcutta, 38,201 cwt. to the North-West Provinces and Oudh, 38,824 cwt. to Bombay Presidency, and small quantities to the Central Provinces, the Pan jib, Berar, and Bengal. As already stated, the road trade with neighbouring states and provinces is large.

The imports are unimportant. In i888-8g they amounted to only 3,780 cwt., of which 129 cwt. was derived from Bombay Town, 2 cwt from Calcutta, 2,328 cwt. from the North-West Provinces and Oudh, 955 cwt. from the Central Provinces, 133 cwt. from the Panjib, and 122 cwt. from Bombay.

5. MADRAS.

References.—Buchanan-Hamilton, Journey from Madras through My-sore, Canara, & Malabar, /., 40, 203, 378, 411; II., IS7\$'98, 221, 253, 254 263, 286, 290, 302, 3'3, 323, 326, 450, 520, 545, 562; III., 317> 323, 3sr; sore, Canara, & Malabar, /., 40, 205, 578, 411; II., 1575 98, 221, 255, 254
 263, 286, 290, 302, 3'3, 323, 326, 450, 520, 545, 562; III., 317> 323, 3sr;
 Shortt, Essay on Cotton in Manual on Indian Agri., i88g, 1-97; Mad. Man. of Admn., I., 289, 299, 334, 335, 359; District Manuals: Cuddapah, 201-204; Coimbatore, 232, 235; Trichinopoly, 74; SettL Repts.: Chingleput, para. 60; A Selection of Papers showing the measures taken since 1847 to promote Cotton Cultivation in India (Parliamentary), 1858, Pt. II.; Mad. Board of Rev. Proc, June 1st, 1889, 266; Repts. by A%rt. Dept.; Exper. Farms Repts.; Note by Dep. Land Rec. & Agri., 1888; Rept. by Collector of Bellary, 1888 ; by Collector of Kuddapah, 1888 ; Note by Mad. Chamber of Commerce, 1889; Extracts from the Proc. of the Covt. of Mad, Rev. & Agri. Dept., 15th Feb., 1800; Elliot, Fl. Andh., 14t, 143, 147, 157; Wheeler, Handbook of Cotton in Mad.; Set. from the Records of the Mad. Govt., 1856, 10, 12, 16, 23,37* 6<>> & 9, 75>t66 ; Agri. 140, 127 ; VI., 118-122, 189-196; VII., 20, 30; XIII., 176,180; Pro. of Agri.' Hort. Soc. of Mad., 1862, Nov., 5 / 1863, Feb., 1-2; June, 1-2; Aug., 3, 5 ; Sept., 4,5 : Nov., 2, 5 / Dec, 8 ; 1864 ; Jan., 10 ; Feb., I, 4 ; Aug., 2; Sept., i-3; Nov., 2, 5 / Dec, 8 ; 1867, Mar., 22; 1868, 129-13/ ; 1866, Jan., 2; Mar., 3-4; April, 7-9; 1867, Mar., 22; 1868, 129-13/ ; 1866, Nov., 3* 4 / *87U 40; (New Series), I., 284j IV., 50.
 REVIEW OF THE AREA, & C—The total area underjcotton in Madras during the year 1888-89 was returned as 1,794,510 acres, Ofthis,i,H9,337 acres

CULTIVATION in MADRAS. 141

Provincial

Trade.

140

Area. 142

SOSSYPIUM.

Cotton Cultivation in

CULTIVATION MADRAS. Area.	were grown in Government villages, 419*249 acres in Inam villages, and 755924 in zemindari villages. The area returned for the first may be accepted as fairly accurate, but the figures for the two last, more especially those for the zemindaris, are less reliable. The cultivation of cotton is steadily increasing in the presidency, the total area, for the year under consideration exceeding the average of the three years preceding it by 90,000 acres. The total outturn in 1888-89 is calculated to have been 801,120 cwt. The net export deducted from this amount leaves 309,343 cwt as available for local consumption, a sum which, when divided by the population, gives an average of only i21b per head. The Madras Board of Revenue, in a recent report to the Government of India, make the following statement:—* On the question of the amount of clothing required to supply the wants of the population, the Board has made careful enquiries, and finds, that as a rule, the people in the Telegu districts use more than those in the Tamil districts, and that, while the lower classes in all districts get on with very little clothing required for a whole year. For juvenles, male and female, excluding children under five years who practically go without any kind of clothing required for a whole year. For juvenles, male and female, excluding children under five years who practically go without any kind of clothing the net imports of piece goods and wrist from this amount, the total amount of raw cotton used in spinning locally is arrived at , and in the year under consideration, is found to have been 28,7 is 370 ke or 257,780 cwt. As already stated, 309,343 cwt. is found, from calculation based on the outturn, to have been left in the presidency as available for local consumption, so 257,780 cwt. As plears to be well within the mark. The 50,000 cwt. of excess is probably partly exported to Madras seaports by road (not included in the trade returns), partly consumed locally for purposes of upholstery, padding, &c. Of the 257,780 cwt. loc
	DISTRICTS. Area under Cotton.
	Acres*
	Kistna
	Bellary
	Anantapur
	Coimbatore
	Madura . Tinnevelly

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G. 143

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(Watt & Murrav.) GOSSYPIUM. Madras.

RACES OF COTTON IN MADRAS.-AS already stated in describing the CULTIVATION commercial "growths" of cotton, there are four kinds grown in Madras, IN MADRAS. vis., Tinnevelly, Westerns, Coconadas, and Salems. Of these, "Tinnevelly" is produced in the Tinnevelly district and the southern portion of Madura; "Salem " in Salem and the Coimbatore districts; "Westerns" in Bellary, Anantapur, portions of Kurnúl and Cuddapah, and in the Nizam's Dominions near Raichore and Lingasagor; and "Coconadas" Races. 144 in the Kistna district. According to a note by the Madras Chamber of Commerce, dated September 1889, "Tinnevelly" is the most valuable of these. It has a strong, though not particularly long staple, and a very pure white colour. It is, accordingly, in considerable demand among spinners at home for mixing with Americans, and is one of the few Indian cottons suitable for this* purpose. "Salem" is inferior, and is considerably used in adulter-ating the more valuable "Tinnevelly." "Westerns" have been subdivided into "Westerns" and "Northerns," the latter being the chief cotton of Cuddapah and Kurnul. The principal markets for "Northerns" are Tadputri, Prudatur, Jangalpille, and Koilkuntla; for "Westerns' Bellary, Adoni, and Raichore. The staple of Westerns is rough, but fairly long and strong and of a good white, but, owing to imperfections in cleaning, always contains a considerable proportion of broken leaf. "North-erns" much resembles "Westerns" in length and strength of staple, but is silkier, and were it not for the slightly reddish tinge which it commonly possesses, would be in greater demand. The staple of "Coconadas" is fairly long, strong, and silky, but, owing to its redness, this cotton, also, is used by comparatively few spinners. It is, however, employed in the manufacture of lace, and is said to take dyes more readily than other growths. In the Provincial cotton report for 1882-83, the races found in Madras ^w There are two forms of indigenous cotton usually grown in this presidency—the one depending on the south-west monsoon, and the other on the north-east. The former is sown between May and July, and the latter between September and November. In Tinnevelly, however, both species are sown in the same season, *i.e.*, October to November. They are known in the Telugu districts as the white and the red species, and in the Tamil districts as uppam or ukkam and ladam or nadam. In the Ganjam and Vizagapatam districts, they are also known as the punasa prath (frattt means cotton) and paira or burada prattu The latter is grown on irrigated lands in the Ganjam district. In all other districts, the crop is grown

on dry or unirrigated lands and is often sown with dry grains. The white or the uppam kind (short staple) is sown in black cotton soil, and its fibre is considered superior to that of the yerra or red cotton. The plant lasts from six to twelve months. The ladam species is grown generally on red or gravelly soils and lasts from three to four or five years in the Tinnevelly, Coimbatore, and Salem districts. The Collector of Tinnevelly reports that this crop yields about 62Jib of uncleaned cotton per acre in the first year the tenth month after sowing, and about 125ft per acre in each of the second and third years from the ninth month after the picking of the previous crop. The fibre is said to be thin and fine, and to be used in the manufacture of superior cloths. The plants grow to a height of from five to six feet, and in Salem yied two harvests in the second year—one in September, the other in Januay. In the third year, the plants are lopped at a height of one foot from the ground, and then only one crop is obtained."

CULTIVATION in MADRAS.

Races.

Races of Cotton in

Royle describes the *uppam* race as a superior form of G. herbaceum, with a staple which more nearly resembles that of American Upland than does any other indigenous cotton. *Nadam*, on the other hand, he describes as a triennial plant yielding a much inferior staple, which is also more difficult to clean. The same writer states that plate 11 in Wight's *hones* is an accurate representation of *uppam*. The plate in question, according to Todaro, is typical of his species G. neglectum.

Specimens of *uppam*, however, which the authors have had the pleasure of receiving from Madras, appear to be typical of G. Wightianum, *Tod.*, a species figured in Wight's *Icones*, *t*. p.

In the absence of a complete set of specimens of the commercial forms of Madas cotton it is extremely difficult to determine the botanical nature of each, but, from information available, it would appear that the better/;lass, •' Tinnevellies " and " Westerns," are produced for the most part by uppam, that" Salems "are derived from a degenerated form of G. barbadense (see p. ig), and that the other inferior cottons of the presidency may be nadam. It appears impossible to correctly determine the latter. In the above description everything points to the plant being G. neglectum, Tod., but on the other hand specimens seen by the authors, bearing the vernacular name of *nadam*, are typical G. herbaceum, *var*. obtusifolium. Specimens of nearly typical G. herbaceum, and of G. arboreum, have also been obtained from different parts of the Madras Presidency, but whether they are regularly cultivated, or would be included under the general term of nadam, the authors cannot say. Between G. herbaceum, G. Wightianum, and G. neglectum every intermediate condition seems to exist. Variations from G. Wightianum towards G. neglectum are much inferior to those towards the G. herbaceum series. Of the former may be mentioned a form known as karumkanni, of the latter that known as villaikanni.

The differences in value and quality of the several commercial forms may, after all, depend, as much on local variations of soil, climate, methods of cultivation, and processes adopted in cleaning, as on any racial distinction.

Besides these Indian races, small quantities of various exotic cottons are grown in certain localities, the results of numerous experiments which have been carried on in Madras for many years. Of these, the only one of commercial importance is "Bourbon cotton" (G. barbadense), which at one time produced the commercial "growth" known as "Salems," and which is still grown to a considerable extent, though in a miserably deteriorated condition, in Coimbatore. The Collector of that district furnished an interesting report on the origin and progress of this exotic, from which the following is extracted :—

"The *Shem parutti* (? *Seemai paruthi*) is that known as Bourbon, and will last as long as five or six years; it grows only on red or gravel soils, especially the calcareous and quartzose; hence* *one* reason why it is extensively grown in Erode Taluk, in which there is not an acre of black cotton soil.

"Bourbon is found in Erode and Dhárá'puram Taluks, especially in the Perundurai and Kángyam Firkas. The following explanation has been given me of its spread in those taluks : about 1820, Mr. Heath bought the cotton godowns in this part from the East India Company and introduced the Bourbon cotton ; he was succeeded by Mr. G. D. Fischer in 1824, and this firm, trading largely in Bourbon cotton, induced extensive cultivation. Gradually the firm's dealings fell off, and consequently, for reasons to be noted, the cultivation of Bourbon declined. The firm's godowns were chiefly at Erode, near Perundurai, Chennimalai, and in the Kangyam Firka. The whole course of the cultivation and trade is a striking com.

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ment on the importance of private enterprise and British capital in developing the country and improving cultivation."

In a subsequent report the Collector of Coimbatorfi wrote :---

"Messrs. Stanes & Co. also inform me that Bourbon, though of excellent quality and much in demand if properly cultivated, is now, as grown in Coimbatore, of miserable quality and hardly worth buying. The reason is to be found in the wretched cultivation, the lack of manure, the continual cropping of the same ground, the complete removal of the plant, stem, lint, and seed from the ground, and the deterioration of seed from want of renewal. It is understood that Messrs. Fischer & Co. used to obtain and distribute fresh seed, and the rayats, as regards their indigenous cotton, expresslj state that seed costs more than the market price because they have to choose only good seed. Apparently the exotic cotton deteriorates unless *fre\$i* seed is supplied; whether this should be the care of the Agricultural Department of be left to the enterprise of merchants is a question. But there can be no doubt that all cotton outturn in Coimbatore has much deteriorated, and that the quantity and quality of the lint and seed are poor.

" It may also be noted that the cotton going south is intimately mixed with Tinnevelly cotton and exported as such, and that the admixture has been detected by the home brokers. It is a pity that such risks should be run by the trade when every effort ought to be made to improve the name of Indian cotton."

The above report elicited the following remarks from the local Board of Revenue :---

"The Board regret to learn that the quality of the Bourbon cotton is declining in the Coimbatore district. From Mr. Nicholson's report its diminished quantity and deteriorated quality are plainly due to exhaustion of the soil resulting from the continued cropping of unmanured land. The superiority of Bourbon cotton to the indigenous variety has been clearly demonstrated to the rayats of Coimbatore, and no expenditure by Government on the importation and distribution of fresh seed would have ^any permanent effect_nor indeed be justifiable, so long as the rayats pursue their present exhlusting methods of cultivation."

It may be of interest to note that records exist of Bourbon cotton in Coimbatore as early as 1804. In the Selections from the Records of the East India Company, dated 1812, a report occurs by the Collector of Coimbatore in which it is stated that there were three forms of cotton at that time in the district, known, as they are now, as *nadam, coputn* (*? ooputk*), and *shem parutti*. The first two are evidently identical with those bearing the same vernacular names. The last, described as a "large plant cultivated in gardens, and used only for spinning Brahminical threads," would appear to have been a form of G. arboreum. The application of the name at one time used for G. arboreum, to the exotic American plant of the present day, is interesting. The Collector then goes on to state that Bourbon cotton had been introduced eight years before, but he appears to have been very sceptical as to any good results ensuing.

^ The above-quoted remarks of the Board of Revenue completely sum up the history of many years of earnest endeavour on the part of Government and also of private enterprise. Good seed has been procured, has been found with careful cultivation to do well, and has been distributed, time after time, to the rayats. As far as can be gathered from available literature, the only result has been that the stock thus introduced has either completely died out in a few years, or, as in the case of Bourbon cotton in Coimbatore, has given rise to a race of cotton much inferior to that natural to the country. So inferior is the produce obtained, that, instead of fetch103

3ULTIVATION in MALRAS.

h of ev- Races*

Dictionary of the Economic

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Method of Cotton Cultivation in

CULTIVATION	ing a higher price in the home market, it can only be got rid of at all by
in MADRAS.	using it to adulterate Tinnevelly cotton.
MADRAS. Races.	The following remarks on the subject of the introduction of new cottons by the Madras Chamber of Commerce are of interest:—" The Chamber is led to suppose that most varieties of seed have been tried from time to time in nearly all districts, and that the variety at present grown is the one that has been adopted owing to its ascertained suitability to the climate and soil of the particular districts. In the sowing time of 1886-87, a systema- tic attempt was made to introduce Broach cotton into the Bellary district; but the plants mostly withered before maturity, and generally the rayats sustained loss over it. Any attempt at the introduction of new seed on a large scale should be deprecated unless the seed has first been experiment- ed with in the same climate and soil for more than one season. Failure generally results, and, even when the plants thrive, the introduction of a new variety is not always satisfactory, as it is some time before the proper market value can be determined by buyers and sellers, 'ind the new variety is often so mixed with the old, that buyers will not pay the same price for the mix- ture as they would for the cottons were they sown separately. The fact of there being in one district two classes of cotton, one of which may com- mand a better price than the other, leads to the extensive adulteration of the better quality by admixture of the inferior." Notwithstanding these facts, numerous experiments were again made at the Saidapet farm, for some years preceding 1886, with all sorts of exotic seed. These once more abundantly proved that with due care and a judicious use of manure, it was possible to grow cotton of a finer quality than the produce of the indigenous races. But there appears to be little reason for believing that, if the Yea valley, New Orleans, or Egyptian cotton, which were all cultivated with great success on the farm, were distributed amongst
Soils. 145	 the rayats, the result would be in the least more satisfactory than that obtained from the Bourbon in Coimbatore. o. METHOD OF CULTIVATION; SOILS, AND MANURES.—Dr. Shortt writes as follows in his •• Essay on Cotton":— "In the culture practised by the native planter, the soil selected is black, soft, porous, and composed of decomposed basalt. It is well known as the <i>regur</i> or 'black cotton soil.' Manure is seldom used, but in some districts the usual dung-heaps or wood-ashes are lightly scattered over the ground, and should cattle not be allowed to enter the fields, the leaves and write of the armitication of the provide the provid
Irrigation.	and twigs of the previous year-are frequently permitted to remain on the ground." IRRIGATION.—As a general rule, cotton fields are not irrigated,—the rayat has, therefore, to depend for the successful growth of his crops, on
Sowing. 147	the periodical rains. SOWING.—The seed of his own growth or of the same district is sown over and over again, each successive year, and this appears to have con- tinued for centuries. It is prepared for sowing by being steeped in a solution of cow-dung and dried in the sun to prevent sticking together, mixed with dry grain or pulse and sown broadcast; in some districts the seed is sown in parallel lines, alternately with pulse, by means of a drill.
	Sowing takes place in some districts as early as June, but seldom later than September, depending, to a great extent, on the particular seasons. The seedlings appear between the third and seventh day. When they are f ^t J ^{eeweeks 00} ** plantation is hand-weeded, which process is re- peated some two or three times during the growth of the plant. Fre- S FINT i when theseedlin S ^{sare} but a fortnight old, a plough is run through me held to loosen the earth as well as to facilitate the removal of weeds. I he plant generally begins to flower about the fourth, and to ripen its
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Madras.

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CULTIVATION fruit at about the sixth month of its growth, but in some rare instances, this MADRAS. does not take place until the eighth month. In the *Coimbatore District Manual* it is stated that *uppam* is Sown in Sowing. October-November, and yields its harvest in March-April. Occasionally, if there is good rain in April, it is interploughed and a small crop taken again in July. It is usually sown with Bengal gram in lines, or mixed with thenei and coriander, and the whole sown broadcast together. The nadam is sown either in July-August mixed with kambu and pulses, or in April-May with cholam and castor, or ginjelly and dhal; sometimes with gram in September. In any case the cereal or pulse crop is reaped in the usual way, and the young cotton plants which have grown up under their shelter are left. In the first and third cases, the first cotton cro[^] is picked in the following¹ July. In the second a crop is got in February, and then not again till the following February. Thenceforward the crops per year are obtained. The crop in the third year yields a small outturn, and is interploughed as often as possible, gram, kambu, and sdmei being sown. In a memorandum furnished by the Revenue Dep?rtment, Madura district, it is stated that, "sowing begins in October and ends in December. Picking is carried on twice in the year from March to April, and from June to July. The land is prepared by ploughing it into time after a shower, and is ploughed over after sowing. The seeds each time after a shower, and is ploughed over after sowing. The seeds to July. The land is prepared by ploughing it five times before sowing, are sown in kerisal, black cotton soil, red soil, and portal. should be manured well, ploughed thrice at least, and the seeds then sown. After the plants have grown to the height of nearly a span, weeding is performed thrice. Ten measures of the seed will sow an acre.' The naturally rude and careless manner in which the native is known to conduct all his agricultural operations is pre-eminently shown in the cultivation of cotton, a circumstance which at once accounts for its usual deficiency in quality. It is surprising to witness, even under these disadvantages, what a large amount is turned out in a tolerably fair season. PICKING.—Dr. Short continues, " The pods, as a rule, are not collected Picking. as they ripen, but are allowed to remain until the whole crop of the field is I48 $f^{a(ty)}$ indeed, so little importance is attached to the speedy collection of the harvest, that even then the rayat consults his own convenience rather than the importance of his duty. In many instances he is either unable to procure labour, or has not the means of doing so; often he is not permitted to gather his produce in small quantities as the fruit ripens, but has to await the pleasure of the merchant from whom he has received an advance. Fre* quently, also, the crop has to be assessed before he is permitted to gather it, during which delay, in most instances two-thirds of the produce fall to the ground where it becomes mixed with dust. Should it happen to rain during this interval, 50 per cent, of the produce is irretrievably lost. In some districts the rayat gathers the early pods, so as to be enabled to come early into market. It is then cleanly gathered. But when the cotton season has fully set in, the price fluctuates, and the rayat being in no hurry to enter the market, thinks the produce may just as well lie in the field •£« in his house. "When the cotton at last is gathered, no care is evinced in removing the dried leaves and other extraneous substances found attached to it. It is generally taken off with all these impurities still clinging to it, thrown into some receptacle, generally a large open bamboo basket, and carried to the stack yard, where it is heaped up amidst the dust which necessarily abounds there. I have often witnessed heaps of cotton, both cleaned and uncleaned, thus lying exposed to wind and weather.

CLEANING AND GINNING.—The produce thus collected is next freed from

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Ginning.

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Cleaning of Madras Cotton.

CULTIVATION seed. This operation is, as in most other localities, conducted by means of an in MADRAS. Indian *churka*. The cotton, as brought in from the field, is freed, to a certain extent, of its capsules, stalks, leaves, &c, and then submitted Ginning. to the churka. In most districts the cotton is previously spread out on a common charpoy or country cot and beaten with switches, when a portion of the minute particles of earthy or other extraneous matter still adhering falls through; but from the slovenly mode of gathering the cotton, no effort, however persevering, can afterwards entirely free it from its impurities. This seating or thrashing is more intended to loosen the wool from the seed (to which it adheres somewhat tenaciously), in order to facilitate the operation of ginning, rather than to clean the cotton. The operation of ginning is generally performed by females, who hold the seed in the left hand to feed the cylinders, and with the right simultaneously turn the churka. A woman, by manual labour alone, car? clean only about four pounds of cotton, whereas with the churka, she can free from about twenty-five to thirty pounds in a day of ten hours. The Madras Chamber of Commerce, in their report referred to above, state that much of the Westerns cotton of commerce is deficient in cleanliness, owing to the common practice of cleaning the fibre by rolling it on stones with iron rods. This is called "stone cotton" in contradistinction to *churka-desLned* or "jowari cotton." The remark is made that a large proportion of the Westerns crop, owing to this system of cleaning, contains too much seed, and is, accordingly, not readily marketable. It appears to be highly desirable that this laborious and ineffectual process of stone-cleaning should be replaced at least by the *churka*. PACK ING.—Dr. Shortt gives the following description of the opera-Packing, tion of packing :- To a strong, perpendicular, wooden post, a cross piece 150 like the balance of a scale is suspended, the post being partly buried in the ground. To the cross piece, a bag of *cumhly* or gunny is attached, intended as a covering to the bale. From five to six maunds of cotton are now thrown in and compressed by men who jump into the gunny and stamp down the cotton with their dirty feet. From six to ten men are sometimes thus employed, whilst others are engaged in bringing the sides of the covering together, and securing them by sewing. In some places the gunny bags are hung by three ropes from the roof of the house; a fourth also, attached to the roof, hangs free in the centre, to which the men stamping the cotton hold on. These bales vary in size and shape, according to the mode by whch they are to be conveyed to the nearest market for export, and which may be either pack bullocks or carts. From the time of picking to that of export, cotton is liable to adulteration on the part of every one of the many through whose hands it passes. DISEASES — The cotton crop in Madras appears, from Dr. Shortfs ex-Diseases, haustive essay, to be remarkably liable to the attacks of numerous insects, **I5I** especially aphides and larvae of moths, and to one or more fungous parasites. Space cannot be allowed for a full description of these in such an article as the present. To prevent the ravages of insects Dr. Shortt re-commends smoking the plants with tobacco, sulphur, or damp straw, or

> and may have to be got rid of by trapping, poisoning, fcc. In the Coimbatore District Manual, the diseases which attack cotton are said to be known locally as sunndmbu, pen (asugani or poriyan), *inversion* to be known locally as summand, per (asignit of portyan), *inversion* and *adakkei*. The first-named is distinguished by brownish- M^{1} ? $f \land f^{Old spois on the leaves and bolls, and greatly diminishes the$ $5.fmT. If <math>JifT^{On} w?^{n}$ third are "due to excessive east winds." *Pin* shows itself by "black spots over the whole leaf and stem;" the G. 151

> dusting the infested parts with tobacco or black peppers. Rats, squirr.els, mice, and other larger animals are all said to be extremely destructive

Cost and Profit of Cultivation. (Watt & Murray.) GOSSYPIUM.

CULTIVATION murulei by sickly drooping, "roughness of the leaves and brownish-yellow in MADRAS. spots." From the description they would seem to be due to fungoid pests, possibly resembling the cotton-rust and cotton-blight (Cercospora gossypina) of America. The fourth is said to be due to excessive rain, the plant runs to wood, and numerous hard bolls are formed, but no fibre. SEASONS OF SOWING AND REAPING.-The subjoined particulars as to Seasons* the time cotton is sown and harvested in the chief producing districts has been taken from a report furnished by the Government of Madras in 1878 in reply to the enquiries made by the "Famine Commission : —

Districts.	Sown.	Reaped.	
Bellary	3rd July to 23rd September.	9th March to 19th June.	
Kistn£	August to October.	January to April.	
Kurnúl	August.	March.	
Anantapiir	July to September.	March to June	
Cuddapah	July.	3rd, 5th, and 7 th months	
Coimbatore	15th July to 14th September.	after sowing.	
Madura	October or November.	14th June to 14th August.	
Tinnevelly	September to January.	January to April.	

Judging from the above table sowings take place from July to Jan-uary, and the crop is harvested from January to August. In the Provincial cotton report for 1882-83, however, it is stated that uppam is sown between May and July, nadam between September and November, the former depending on the south-west monsoon, the latter on the north-east. On the other hand, the Collector of Coimbatore reports that in his district uppam is sown in October-November, and reaped in April-May. From these conflicting statements it would appear that both varieties may be sown either during the north-east or the south-west monsoon.

COST AND PROFIT OF CULTIVATION.—The annexed statement shows t}ie cost of cultivation per acre as given by Collectors in 1882-83 and the value of the average outturn of cleaned cotton at annas 3-6 per ft :-

	AVERA	GE COST PER	ACRE.	Value of
DISTRICTS.	Including Assessment.	Excluding Assessment.	Excluding Assessment and Cost of Manuring and Fencing.	Outturn per acre at 3£ annas per tb.
North Arcot	R a. p.		<i>R a, p</i> . given.	R a. p.
Trichinopoly	9 15 o	8 14 4	5 »3 6	3 «5 °
South Arcot	10 6 y	8 10 8	6 6 3	4 13 O
Anontonur	77»°	$\begin{array}{c} 6 & 6 & 6 \\ 2 & 5 & 0 \end{array}$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	54 0
Bellary		$\frac{2}{2}$ $\frac{3}{7}$ $\frac{1}{1}$	$\begin{array}{cccc} 2 & 5 & 0 \\ 2 & 2 & 3 \end{array}$	5 11 0 5 14 6
Kurnúl	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2 14 o	2 14 o	69 0
Kistna	850	650	3 5 0	6126
Ma/iura • • • •	8 13 5 10 1 2	759	522	8156
Tanjore • • • •	1 2 24	8 13 9 5 8 0	$\begin{array}{c} 7 & 1 & 3 \\ 5 & 8 & 0 \end{array}$	96 6
Coimbatore · · · · · · · · · · · · · · · · · · ·	6 12 0 12 11 9	10 15 6	580 7'56	9 10 o
Gan jam _ · · · · · · · · · · · · · · · · · ·	7 9 n		564	9100 9100
Cuddapah • • •	5 8 0		3 4 0	910 o >046
Salem • • •	10 14 o	980	580	
Vizagapatam • • • •	11 2 n	856	510	11 9 6
Tinnevelly • • • •	798	6 12 9	524	15 8 6
South Canara • • •	14 0 0	+++		1940

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CULTIVATION In MADRAS, Cost,	The Government of Madras commented on the above table as follows:— "Analysing the details of the items given in the district reports, it observed that the value of seed varies from 2 to 3 annas in Kurnúl, Belary, Anantapur, and Kistna, to more than double that rate in Cuddapa South Arcot, Tanjore, Trichinopoly, Coimbatore, and Salem. The cost of ploughing is given at more than R3 per acre in South Arcot, as again					
Madras Trade. 154	 bioughing is given at more than KS per acte in South Arcot, as again less than half the amount in several of the other districts. There a similar disparities in the other items also. The total average cost for Ganjam district is more than double that given in Fasli 1291 (1881-8 The explanation furnished by the Collector is that many of the items not involve actual outlay. In Mr. Nicholson's report the cost of cultition in black cotton soils is worked out at R7 per acre, which is probal nearer the truth." <i>[Paragraph 8, Cotton Report, ISO^-SJ)</i>. If it be assumed that the average outturn be proportionately equal value to the exports from the presidency by rail, the average value per a in the year under consideration may be arrived at as follows. The average exports by rail were 433,925 cwt., value R 1,06,31,102, therefore the va of 1 cwt. was approximately R22. The value of the average outturn (50 was therefore Rg-i3» an amount which, assuming the above cost of R7 pace, would leave R2-13 to cover the cost of cleaning, packing, and to g a small profit. ANALYSIS OF THE TRADE.—The great proportion of the cotton product in the Ceded "Districts (Bellary, Anantapur, Cuddapah) and Kurr is sent to Madras by rail for export. Some portion is also sent Bombay. The cotton produced in Godavari, Kistna, and Nellore is s by canal and road to Cocanada, and since the opening of the Buckingh. Canal a part goes by that route to Madras. The produce of the South districts is exported from Tuticorin, to which it is conveyed, partly gail and partly by road. The following statement, which has been extracted from the provinc cotton report for 1882-83, shows the mode in which the fibre is convey to the ports of shipment from the interior of the presidency :— 					
	DISTRICTS.	To what Places sent.	Mode of Conveyance.	In what shape carried.		
	1	Madras		Mostly in pressed bales.		
	Bellary Canara, South .	Madras and Bombay Mangalore and Bar- kur.	Do By road	In pressed bales. In impressed bales.		
	Cuddapah Godávari	Madras Cocanada	By rail By canal and road .	In pressed bales. In pressed and half- pressed bales.		
	Kistna • • Kurnúl • •	Cocanada, Madras, and Masulipatam. Madras and Bombay	By road and canal . By road and rail and	In pressed bales. In loose bales.		
	Madura ,	Tuticorin and Mad- ras.	in boats. By road and rail .	0 In unpressed bales.		
	Malabar Tinnevelly	Beypore, Cannanore, and Calicut. Tuticorin	By rail and road . By road and rail .	In pressed and un- pressed bales. Do. do.		
	Trichinopoly Tanjore	Madras and Tuticorin Negapatam	D'	In pressed bales.		

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ftladras Cottons.

(Watt & Murray.) GOSSYPIUM.

CULTIVATION It is impossible, from want of perfect statistics regarding road, river, and canal traffic to make an attempt at giving complete figures regarding the provincial trade of Madras. The following statements must, therefore, be recognised as referring to rail and sea traffic only. Probably the road transactions in cotton are comparatively small; but, on the other hand, the canal-borne traffic is large and important. Much of the cotton produced in the western part of the Presidency finds its way to Guntur, whence it is despatched in great part by canal to Cocanada, Masulipatam, and Madras. The only figures available for this traffic are those in the Administration Report of the Public Works Department, Irrigation Branch, from which it would appear that 10,276 tons of raw cotton were registered in 1888-89 as passing up and down the Godavari, Kistna, Kurnul, Cuddapah, and Buckingham Canals. Of this amount 7,947 tons passed down towards the seaports, of which 1,496 tons went down the Buckingham Canal towards Madras. Though it is impossible to give a complete analysis of this trade, its importance must be remembered in consulting the following figures, as it probably greatly increases the exports from the province to the seaports, and may, in part, explain the apparent deficiency in the amount available for consumption in the town of Madras.

The total registered exports by rail and sea in 1888-89 amounted to 592,865 cwt., of which 575,980 went to the seaports of the presidency for shipment. Of the remainder, 12,259 cwt* went to Bombay port, 3,043 cwt. to Mysore, 1,577 cwt to Bombay Presidency, and 6 cwt. to the Nizam's territory. The exports by rail to Madras seaports amounted 10417,040 cwt., and were made up by 235,275 cwt. to Madras town, 155,832 cwt. to Tuticorin, 14,786 cwt. to Calicut, 7,102 cwt. to Pondicherry, and 4,045 cwt. to Negapatam.

The total imports amounted to 98,039 cwt., of which 52,966 cwt. were derived from the presidency seaports, 45»°73 from other Presidencies and provinces. Of the latter amount 30,226 cwt. came from the Nizam's territory, 14,787 cwt. from Bombay, and 60 cwt. from Mysore.

6. NORTH-WEST PROVINCES AND OUDH.

References.—ZWAiV & Fuller, Field & Garden Crops, II., 75, pi. xviii. ; Atkinson, Him. Dist., 738; Bonavia, Notes on Foreign Cult, in Oudh (1863) ; Gasetteers :—I.,79 ; II., 167 ; III., 225, 375, 4*3; IV., I xviii. ; Rep. Dir. Land Rec. and Agri., N.-W. P., Oct. 1889; Govt. Rep. on Cotton Crop of N.-W. P.; Settl. Reportsz—Asimgarh, 123; Shajahan-pur, xv.; Allahabad, 25-26; Bareilly, 82, 87 ; Selections from Records of Goyt. of N.-W. P. (Second Series), IV. (it.), 99; VI., 283, 568; A selection of papers shewing the measures taken since 1847 to improve Cotton cultivation in India (Parliamentary), 1857, Pt. I.; Agri-fiort. Soc. of India, Transactions :—III., 133, '77; V., 54, 55, 67; VII., Proc. 17 ; VIII., 64; Journals (Old Series) :—•/., 25, 37, §14, 184,187 ; II>i 337; IV., J06, 107, 108; VI., 149; XH'> *7-**> 212-264.

REVIEW OF AREA, & C-AS will be seen from the table, p. 56, the total area under cotton in these Provinces in 1888-89, including mixed crops, amounted to 1,399,388 acres. As already stated in discussing the races of Indian cotton, the average area has shown a marked increase during the past twenty years. In the year under consideration, however, a considerable falling off is exhibited, the average during the five years preceding having been 1,615,600, and the maximum in 1886-87, no less than 1,885,487 acres.

The total outturn in 1888-89 was 706,344 cwt., giving the average of about 60ft per acre. A comparison of the total import, 112,006 cwt.,

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Area.

Cotton Cultivation in the

with the total export, 825,734 cwt., shews the net export to have been 703,728 cwt., a quantity very nearly equal to the estimated total production. Thus, by deducting the net export from the total production, only 2,616 cwt. are shown to have been left for local consumption, a result which is obviously highly erroneous. In a report on cotton, dated 1889, by the Government of the North-West Provinces, it is explained that this error is due to the unregistered road traffic, a great deal of cotton being imported by road from the Panjab and Rajputana to take the rail at Agra, Hathras, and other cotton-pressing districts. In 1877-78, a fairly compre-hensive registration system for trade by road and river was enforced, with the result that the net import by these channels was found to average 200,000 cwt. a year. Assuming that this import continues, the figures above given, as available for local consumption, will be supplemented by a credit of 200,000 cwt. per annum in favour of the province. This will represent fully two-thirds of the estimated home consumption (300,000 cwt.), the remainder could be accounted for by very slightly raising the estimate of yield. The writer of the report above referred to, commenting on these facts, writes, "The weak point in this argument is, that possibly with im-proved railway communication with the Panjáb and Rajputana, road imports may have fallen off since 1879. As to this I have no figures. There is no doubt, however, that cotton still travels largely by road even where the railway competes directly with this mode of conveyance, and that all but a very small portion of the cotton exported from Agra city by rail finds its way into it by road. As the rail exports from Agra city average about one-third of the total rail exports of the province, this fact is significant." From these arguments it appears safe to assume a local consumption of approximately 300,000 cwt., which, when distributed over the population of 43,268,599, gives an average of a little less than '81b per head, or, taking Indian cotton cloth at 4*3 yards per fc, about 3'44 yards to each individual. Commenting on the small average consumption of local cotton, the author of the above-quoted report writes, "Although the estimated home consumption of raw cotton is put at 300,000 cwt. a year, it is quite possible that, for a series of years, it may fall below this if the prices of cotton are high and the demand active in Calcutta and Bombay. This has been the case during the last few years. The native weaver then finds it cheaper to buy imported yarn, and the poorer classes economise in the matter of quilts and cotton-padded garments. These are the two chief uses to which raw cotton is put in the province, and the magnitude of the imports into it of yarn and piece goods of all kinds show how readily a substitute for the demand of raw cotton can be found. I will give the leading figures of the yarn, twist, and piece goods trade. The net imports of piece goods into the North-West Provinces and Oudh represent an average value of 450 or 500 lakhs of rupees a year, the net imports of twist and yarn average 40 lakhs a year. As 300,000 cwt. of raw cotton are worth, at most, only 60 lakhs, it is obvious that the home consumption of raw cotton is a comparatively minor item in the total annual expenditure on clothing of the population of these provinces."

Of the 300,000 cwt. allowed above for local consumption, a considerable proportion is worked up by the five cotton mills which at present exist in the provinces. In 1888-89;^{tnese a re} returned as having consumed 94,766 cwt., of which, however, a certain amount may have been imported as yarn or twist.

IT - P? ? 10 * 8 WHERE GROWN.—Almost the entire cotton crop of the

Districts.

unitea Provinces is grown within an irregular belt of country running down the Ganges-Jamna Doab, to which Rohilkhand and Bundelkhand G. 157

						AREA UNDE	R COTTON.	Total outturn	Area
	[DIV	/ISIO	N.			Mixed.	Unmixed.	of cleaned Cotton in cwt.	
		·				Acres.	Acres.		
leerut •	•		•			207,540	165,110	287,235	
gra ,	•	•	•		•	382,001	61,653	250,238	
ohilkhand		•	•	•	•1	134,232	31,074	62,009	
llahabad	•	•	•	•	•	276,884	5.440	69,912	
enares .	•	•		•	•	6,810	2,710	2,495	
nansi •	•				•	60,206	2,898	14,633	Į
uclmow	•	•		•	•	24,982	2,535	8 386	
tapur .		•	•	•	•	23,802	2,535 3,803	7,7''	
yzabad .			•	•	• ¦	613	584	821	ļ.
ae Bareli		•	•	•	• •	695	756	71.9	1
'arai (dUt.)	•	•	•	•	•	2,824	2.236	2,086	
			тот	FAL		1,120,589	278,799	706,344	

N.-W. Provinces and Oudh. (Watt & Murrav.) .GOSSYPIUM.

Races of Cotton.—The only cotton of commercial importance grown in the North-West Provinces is the form known as' Bengals, which probably consists of hybrid forms between G. Wightianum and G. neglectum, and is almost identical with many of the Panjdb forms with short white staple. In addition to this, however, purer forms of G. neglectum, Tod., and G. arboreum, are sparsely cultivated in parts of Oudh and the more eastern districts of the North-West Provinces, where the latter is ordinarily known as *narma*, the former as *manua*. A good illustration of G. neglectum, Tod., the manua cotton, is given in Duthie and Fuller's Field and Garden Crops under the name of G. herbaceum. A superior forn* of manua grown in the Allahabad district is called radya {cff. the account given under G. arboreum for Mirzapur and Goruckpur cottons, p. 10). Both these differ considerably from the ordinary cotton in the season of their growth, not bearing cotton till the hot weather months, instead of at the end of the rains. In a recent communication on narma and manua collectively, the Government of the North-West Provinces reports that " the area in a single holding rarely exceeds a quarter of an acre, and its total area in the United Provinces does not exceed 13,000 acres. In outturn and other details it does not differ much from the ordinary variety of the province."

The hill cottons of Kumaon and Garhwal are. like those of the Paniáb-Himálaya, hybrids with a strong strain of G. arboreum on G. Wightianum.

Numerous attempts have been made by Government to introduce the finer varieties of American cotton into this, as into other, cotton-growing regions. The following exhaustive account of these experiments may be quoted in entirety from the Note on Cotton by the Revenue and Agricultural Department:-

" Experiments were undertaken at the Cawnpore Experimental Farm in 1881-82, in which trials of Hinganghdt cotton and of the varieties of American cotton known as New Orleans and Upland Georgian, were made on two classes of soil, a light loam and a heavy loam, against two varieties of country cotton—one, grown in Bundelkhand and known as kulpahar, and the other, that commonly cultivated in the Cawnpore district. The results went to show (1) that for light soils the indigenous-cotton is by far the most proRaces. 158

Conf. with P. 7.

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Dictionary of the Economic

GOSSYPIUM.

Cotton Cultivation in tfte

 N. y^m₁ p. & Orleans cotton can be grown with success and profit. The results of trials with Nankin cotton are thus summarised in the Cawnpore Experimental Farm Report for the <i>kkarif</i> season of 180: (page 6):— "Of this variety it is necessary, in view of the interest lately taken in it, to make a separate note. To all appearance, in the field before the boll burst, the plant is the same as that of New Orleans or Upland Georgian and quite different, therefore, in growth and leaf to country cotton. It was grown at the farm some few years ago, but discontinued owing to the un favourable reports on its staple received from Calcutta. This year som seed was received from the Saharanpur Botanical Gardens and from th Rawatpur estate, where it had been grown, as well as on other estates in the Cawnpore district, for several years past. On the plant the cottoil's of dirty fawn colour mixed with white; bolls of fawn-coloured int and o pure white lint being sometimes found on the same plant. After ginning spinning, and weaving, the result is a dark khaki-coloured cloth of uniform the admirably adopted for army clothing. The colour can, apparently be bleached, judging from a coat shown to me at the Elgin Mills, but doe not seem to be recognised by native weavers. " This cotton is cultivated in Central India and woven into cloth for the regiments of Central India Horse. Lieutenant-Oolonel Martin, O.B., it ply to inquires, has kindly sent two samples of cloth of first and secon quality. The Officer Commanding the 23rd Pioneers has bare been received specimens of the cotton, and of cloth manufactured from it at the Samples of Nankin cotton took prizes at the Madras Exhibition in 185. The Secretary to the Muir Mills, Cawnpore, writes:— " This Company has grown for some years crops of this cotton and h samples of Nankin cotton took prizes at the Madras Exhibition in 185. The Secretary to the Muir Mills, Cawnpore, writes:— " This cotton see any any of N		
 OUDH, Races. Cawnpore Experimental Farm Report for the tkardiffuses of 1802 (page 6):— "O this variety it is necessary, in view of the interest lately taken it it, to make a separate note. To all appearance, in the field before the ball burst, the plant is the same as that of New Orleans or Upland Georgian and quite different, therefore, in growth and leaf to country cotton. It was grown at the farm some few years ago, but discontinued owing to the un favourable reports on its staple received from Calcutta. This years som seed was received from the Saharanpur Botanical Gardens and from the Rawatpur estate, where it had been grown, as well as on other estates in th Cawnpore district, for several years past. On the plant the cottol³⁵s of dirty fawn colour mixed with white; bolls of fawn-coloured lint and o pure white lint being sometimes found on the same plant. Affer ginning, and weaving, the result is a dark khaki-coloured cloth of uniforr thn, admirably adapted for army clothing. The colour can, apparently be bleached, judging from a coat shown to me at the Elgin Mills, but doe not appear to fade with ordinary washing and wear. The mills object to it staple as being difficult to work with machinery, and the English operatives at the Elgin Mills say that on account of this at admirably adapted for corps raised near Mian Mir by Subadar-Maji (loth and cotton from crops raised near Mian Mir by Subadar-Maji (loth and cotton from crops raised near Mian Mir by Subadar-Maji (loth and cotton from the Cotton Hand-book of Madras tande seen received specimens of the cotton, and of cloth manufactured from it at the Samples of Nankin cotton took prizes at the Madras Exhibition in 185 The Sceretary to the Muir Mills, Cawnpore, writes:— "This Company has grown for some years crops of this cotton and he samples of Nankin cotton roceived appear to be of fairly un tom colour save that from the Sum shufe. Loth adapted than the rest, though but a slight shade different to the first qu	in	fitable; (2) that on better class soils, and with careful cultivation. New Orleans cotton can be grown with success and profit.
 ⁿ Of this variety it is necessary, in view of the interest lately taken in it, to make a separate note. To all appearance, in the field before the boll burst, the plant is the same as that of New Orleans or Upland Georgian and quite different, therefore, in growth and leaf to country cotton. It was grown at the farm some few years ago, but discontinued owing to the un favourable reports on its staple received from Calcutta. This years some seed was received from the Saharanpur Botanical Gardens and from th Rawatpur estate, where it had been grown, as well as on other estates in th Cawnpore district, for several years past. On the plant the cottopils of dirty fawn colour mixed with white; bolls of fawn-coloured lint and op upre white lint being sometimes found on the same plant. After grinning spinning, and weaving, the result is a dark khaki-coloured cloth of unifort that, admirably adapted for army clothing. The colour can, apparently be bleached, judging from a coat shown to me at the Elgin Mills, but doe not appear to fade with ordinary washing and wear. The mills object to it staple as being difficult to work with machinery, and the English oper tives at the Elgin Mills say that on account of this difficulty it is know to the trade in England as "rotten cotton '-a difficulty, however, which doe not seem to be recognised by native weavers. " This cotton from crops raised near Mian Mir by Subadar-Maji Nat ha Singh, A.D.C., and from the Government of Madras has peears th samples of Nankin cotton took prizes at the Madras Exhibition in 185 The Secretary to the Muir Mills, Cawnpore, writes:— " This cormpany has grown for some years crops of this cotton and the samples of Nankin cotton rock prizes at the Madras Exhibition in 185 The Secretary to the Muir Mills, Cawnpore, writes:— " This cormpany has grown for some years crops of this cotton and hamufactured dill from the same. I enclose a pattern of the dill fory ovexamination. We have endeavoured to us, but a	OUDH.	Cawnpore Experimental Farm Report for the <i>kkarif</i> season of 1802
ot demand, the market rate has been purely nominal."	Races.	 (page 6):— "Of this variety it is necessary, in view of the interest lately taken in it, to make a separate note. To all appearance, in the field before the bolls burst, the plant is the same as that of New Orleans or Upland Georgian, and quite different, therefore, in growth and leaf to country cotton. It was grown at the farm some few years ago, but discontinued owing to the un-favourable reports on its staple received from Calcutta. This year some seed was received from the Saharanpur Botanical Gardens and from the Rawatpur estate, where it had been grown, as well as on other estates in the Cawnpore district, for several years past. On the plant the cottoiPis of a dirty fawn colour mixed with white; bolls of fawn-coloured lint and of pure white lim being sometimes found on the same plant. After ginning, spinning, and weaving, the result is a dark khaki-coloured cloth of uniform that, admirably adapted for army clothing. The colour can, apparently, be bleached, judging from a coat shown to me at the Elgin Mills, but does not appear to fade with ordinary washing and wear. The mills object to its staple as being difficult to work with machinery, and the English operatives at the Elgin Mills say that on account of this difficulty it is known to the trade in England as * rotten cotton '—a difficulty, however, which does not seem to be recognised by native weavers. "This cotton is cultivated in Central India and woven into cloth for the regiments of Central India Horse. Licutenant-Oolonel Martin, O.B., in reply to inquiries, has kindly sent two samples of cloth of first and second quality. The Officer Commanding the 23rd Pioneers has sent samples of cloth and cotton from crops raised near Mian Mir by Subadar-Major Nat ha Singh, A.D.C., and from the Government of Madras It appears that samples of Natkin cotton took prizes at the Matara Exhibition in 1859. The Secretary to the Muir Mills, Cawnpore, writes:— "In Scompany has grown for some years crops of this cotton
		G. 158

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N. W. Provinces and Oudh.	(Watt & Murray.)	GOSSYPIUM.
In the <i>kharif</i> season of 1884 three variaties of N	nkin cotton were tr	ed CULTIVATION

In the *kharif* season of 1884 three varieties of Nankin cotton were tried In N.-W. P. & OUDH. on the farm, vt5.;-(1) With seed procured from Yarkand. (2) With seed received from China through the Government of India. (3) With seed acclimatised on the farm. Races.

In reporting the results the Director of Land Records and Agriculture wrote as follows :--- "There is a marked difference in the habits of the three varieties. Nos. 1 and 2 appear to be of the Oriental variety, having few bunches and small deeply-indented leaves similar to the ordinary cotton of these provinces. No. 3 is distinctly occidental or similar in growth and habit to American cotton. Germination in case of the China seed was very irregular. Fields sown at the rate of 18 to 20 seers (36 to 40ft) of seed per acre had not as many plants as fields sown with 3 seers of the acclimatised variety* The plants were very stunted; most of them died before October, and those which survived bore scarcely any cotton. The fate of plants raised from the Yarkand seed was not much better. The fields sown with acclimatised seed fared comparatively well."

Samples of American and of country cotton cleaned in 1882-83 with the Burgess (Emery) saw-gin and with the ordinary country *charkhi* were submitted to the Manager, Elgin Mills, Cawnpore, for opinion. His report is as follows :-

" After carefully examining the samples and comparing the cotton ginned with the native *charkhi* in the ordinary manner with that ginned with the Emery saw-gin, I have arrived at the conclusion that the staple has not been injuriously affected by the latter process, *i.e.*, cut, broken, or otherwise appreciably damaged; while the superiority of the saw-gin over the old primitive method is very marked, so far as opening out and cleaning the cotton is concerned, as applying to Upland Georgian and New Orleans. The effect of the saw-gin on the short-stapled country cotton, however, is that the seed is partially broken in the process, and small particles adhering to the fibre are passed through the machine, which materially reduces its value for spinning purposes. I am of opinion, therefore, that the Emery saw-gin, while doing its work admirably on the long-stapled varieties, is not so well suited for cotton grown in the North-West Provinces and usually known as * Bengal.'''

The Director of Land Records and Agriculture adds:—^M• I may note that a sample of the country cotton cleaned by the sawgin and sent to the Cawnpore market was rejected by the dealers, not on account of any supposed injury to the staple, but on account of its clean appearance, the dealers suspecting that it was old cotton cleaned with a Belna's bow.'

In the *kharif* season of 1887, experiments with cotton of two varieties, (1) Louisiana, and (2) Egyptian, were tried on the farm, before and after the rains. The early-sown plots gave more satisfactory results than those sown late. In each case the Egyptian variety is said to have proved more suitable to the climate and soil of the north-west than the other. In two plots country cotton, and in two other New Orleans, were sown. In both cases the yield with gypsum and kainite was greater than without thsm. New Orleans gave an outturn of 145ft clean cotton per acre, and country cotton 121 ft.

Nankin cotton was also tried; the points to be determined were—(a) for how many years the plants will continue to bear; (b) whether the yield is equal to the annually-sown crop or not; (c) whether there is any change of colour in the produce of the annual and perennial plants; and lastly (d) whether rationing makes any difference? With regard to (a), it has been sufficiently proved that the Nankin cotton plant is perennial, and will yield

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Cotton Cultivation in the GOSSYPIUM. CULTIVATION and stand for several years. If kept long, it thrives well, becomes more bushy, and produces more pods. But compared with the fresh-sown cotton N.-W.P.& a greater number of pods do not yield fine cotton. It is also shown that with the age of the plant the seed becomes smaller and smaller, and there-Baces. fore the percentage of clean cotton on seed increases. With regard to (b)tthe unfavourable nature of the season interfered much with the experiments. One of the plots sown this year yielded 1721b cleaned cotton per acre, and the other only 40ft, while the produce of the plots sown three years ago was 85th per acre in each case. With regard to (p) and $\{d\}_{g}$ there was apparently no difference between the colour of the produce of the two kinds of plants, nor was there any difference between the results of ratooned and unratooned plants. The foregoing trials have con-clusively shown that early sowing of all *kharif* crops, especially cotton, is advantageous. SOILS AND MANURES.-Messrs. Duthie and Fuller write," Cotton land Soils. may be either the very best or the very worst in a village. As a rule, .159 cotton is grown on good land, a loam being preferred, and is either manured itself, or reaps some benefit from a manuring applied to a crop which preceded it. District returns show that about 32 per cent, of the cotton crop is grown on land manured specially for it, 39 per cent, on land manured in the previous year or two years, and 38 per cent, on land altogether unmanured. A very large proportion is grown with manure, but, on the other hand, it is a common crop on poor soils, such as the raviney calcareous tracts in the neighbourhood of great rivers, which is said to actually improve by the manure of the leaves which fall from it. When sown on high class soil it is generally grown alone, while on poor ground it is almost invariably mixed with a large proportion of pulses and oilseeds. Hardly any of the Bundelkhand cotton, which is by far the best in the provinces, receives manure, nor does the black soil on which it is generally grown appear to require it. ' METHOD OF CULTIVATION.—The following account of the method of Method. cultivation pursued is extracted from Messrs. Duthie and Fuller's Field 160 and Garden Crops :-SEASONS.—Cotton is a *kharif* crop, being the one first sown after the Seasons. commencement of the rains" (with the exception of a large portion of 161 the crop of the Meerut district, which is sown with the aid of artificial irrigation a month or so before the setting in of the monsoon), "and yielding its produce from October to January. This is with the ordinary variety, but narma and radya cotton do not bear a crop till the April and May following their sowing, and thus occupy the ground for at least eleven months. Cotton fills no place in any special rotation of crops, although it is reported generally to succeed sugar-cane in Meerut, and to intervene between two cereal crops in Bareilly, the deduction being merely that it is grown on good land which had at all events been manured in the preceding year. It is off the ground too late to admit of its being followed by a rabi crop in the same year, but an ingenious method of gaining a second crop off cotton fields is to sow the oil-seed dudn (Eruca sativa) broadcast amidst the crop just before it is finally weeded. The seeds are buried in the operation of weeding, and the *dudn* plants do not become tall enough to inteffere with the cotton until the latter has finished bearing. Mixtures. MIXTURES. Collottois is comparatively elelolong grown about, but is, as a The, as so so show with the but root five subcouling coops, amongst which the attem is trie chief.. The arhar is generally sown in parallel lines, not broad-cast, and it is said that the cotton plants find in its shelter some protection from cold winds and frost. The oil seddtill, ongoing dlly, occupies the fifst place amongst the remaining subordinate crops, which comprise the pulses

N. W. Provinces and Oudh. (Watt & Murray.) GOSSYPIUM.

urd or mung sown broadcast, and an edging of castor and of the fibre CULTIVATION plant known as patsan (Hibiscus cannabinus). in N.-W. P. & OUDH. TILLAGE AND SOWING.—The land is ploughed from four to six times on the first fall of rain, and the seed is sown broadcast at the rate of 4 to Sowing. 6 seers per acre and ploughed in. The seed is generally rubbed with cow-162 dung before sowing, which prevents its clinging together in masses as it would otherwise do, and is also said to stimulate its growth. Irrigation is applied to about one field in seven, and this much only in Canal Districts, where watering will not cost more than from one to two rupees. Narma cotton requires but little waler, although it has the whole of the cold and part of the hot weather to stand before it produces its fibre. The radya variety, however, is said to require copious irrigation. It is essential to the proper growth of the plants that they be kept free from weeds, and the ground is, as a rule, carefully weeded by hand at least twice in the season, and often four times. PICKING.—The cotton bolls begin to open in October^{*} and picking Picking. is in progress from then till the end of January, unless cut short sooner by **I63** frost,-the great enemy of the cotton plant. Good fields are picked every third or fourth day, but only between sunrise and mid-day, while the cotton remains damp with the night's dew and comes away easily. If force is necessary to separate it from the boll, bits of pod-shell come away with it, which are technically known as 'leaf' and greatly damage the commercial value of the prodfuce. Cotton picking is generally done by women, who are remunerated by receiving ith to T th of the pickings. CLEANING.—For 'ginning' or separating the cotton fibres from the Cleaning. seed, a simple but ingenious machine is used (called a charkhi), consisting I64 of two small rollers about a foot long (one of iron, the other of wood), each with one end turned into an endless screw, and so geared one into the other, that when one-the wooden one-is turned by a handle, the other also turns in the opposite direction. When cotton is applied to the rollers the fibres are drawn through, and are in this way parted from the seeds. With this instrument a woman can turn out from 4 to 5ft of clean cotton fibre a day. The proportion of fibre and seed varies considerably, being in great measure dependent on the quality of cultivation. Occasionally it rises as high as fths or falls as low as |th, but -Jrd is the general average. It is interesting to note that an instrument practically identical with the charkhi is used for cotton cleaning by the negroes of the Southern States of America. INJURIES AND DISEASES.—Stagnant water is most harmful to the cotton Diseases. 165

plant, especially at the commencement of its growth, and fields selected for cotton are, as a rule, those in which water does not lodge. Rain, when the pods have begun to open, is also most damaging, since the fibre becomes discoloured and rotten. Early frosts may altogether terminae the picking season a month or six weeks before it would otherwise have ended, and hence the eagerness shown to get the cotton seed into the ground as soon as possible. Caterpillars are often very destructive, sometimes stripping a field entirely of its leaves, and an immense deal of loss results from the ravages of a small white grub (called *súndi*) which lives within the pod."

YIELD PER ACRE.—The question of yield per acre in the North-West Provinces, has formed the subject of considerable discussion, and has given rise to many conflicting statements. Thus, Messrs. Duthie and Fuller write : "There is no crop the outturn of which has been so systematically under-rated as that of cotton, and if we are to believe the district reports of the last three years, the provincial average is only 5Q/8& per acre, in which case it may be demonstrated that it would not pay to grow it at all.

Yield. 166

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GOSSYPIUM	Cotton Cultivation in the
CULTIVATION In NW. P. ft OUDH. Yield.	After consideration of the estimates arrived at by settlement officers, which exhibit, it must be said, the most astounding discrepancies, and utilising the experience of two years on the Cawnpore Farm, an all-round estimate of 170© of clean cotton per acre of irrigated, and 150ft per acre of un- irrigated land is the lowest which can be safely struck, except for Oudn and the Benares Division, where 100ft may be taken as sufficient, <i>ror</i> cotton mixed with <i>arhar</i> , these outturns should be reduced by about 25 per cent." On the other hand, the recent report by the Director of 1^nd Records and Agriculture, dated 1889, contains the following:— ^w Considering that the American average is only 160ft per acre, the estimate given in <i>Field and Garden Crops</i> appears high for India, and the enquiries prosecuted by this Department confirm this suspicion. After considerable correspond- ence with agriculturists of all classes, the following standards of yield have finally been adopted by this Department as the full average yield for the several portions of the North-West Provinces and Oudh :—
	DISTRICTS. . OUTTURN OF CLEANED COT- TON PER ACRE. Alone. Mixed.
	Gangetic Doab.IbRohilkhand and Terai.130Bundelkhand60Benares Division and Jaunpur.120Oudh55
Cost. 167	The latter figures being probably the more carefully and thoroughly estimated of the two, have been adopted by the authors in their statistics of total yield of the provinces. At the same time the argument based on the yield of American cotton does not appear to be altogether without flaw. Many Indian cottons, for example, the Sindi, produce a very much larger outturn than that laid down for the cotton of the North-West Provinces ' by Messrs Duthie and Fuller, and there seems no reason why the native cotton in this province should not produce equally largely. COST & PROFIT OF CULTIVATION.—The cost of cultivation is estima- ted by Messrs. Duthie and Fuller, as follows :—
	Ploughing (four times) $R a. p.$ Clod crushing (twice) $3 0 0$ Seed (nominal) $0 2 0$ Sowing $0 13 0$ Weeding (twice) $3 0 0$ Picking d\jth produce on 200ft) $4 0 0$ Cleaning (at it anna per iolbj $1 14 0$
	Manure (100 maunds) Total 13 1 0 Rent 6 6 0 6 8 0 GRAND TOTAL 22 9 0
	It appears probable that the above cost is considerably over-estimated.

the more so since comparison with similar statements regarding Bombay G. 167

N. W. Provinces and Oudh. (Watt & Murray.) GOSSYPIUM.

and other provinces, shows that in the latter the cost is returned at only CULTIVATION in N.-W. P. & OUDH. from one-fourth to half of the above grand total. If the above-quoted statistics as to outturn per acre be accepted as correct, R22-9, expended on the cultivation, is much too large to admit of the crop being grown at all. Cost. Thus, assuming the value of the total production to be proportionately equal to the value of the exports, we have, 825,734 cwt.: $7^{\circ}6,344^{\text{cwt}}$.» : R 1,99,43.447! Ri>70,59>73⁶» which last figure, when divided by the total area, gives an average value of R12 per acre. It may be noted that this figure very closely corresponds with the value obtained by a similar calculation for the acre crop of the Central Provinces. Provincial

ANALYSIS OF LAST YEAR'S TRADE.—Of the total exports, 825,734 cwt., the largest proportion, *vis.*, 397,825 cwt., went to Bombay, while 348,233 cwt, went to Calcutta. Smaller quantities were consigned to Bengal and Bombay Presidencies, Rajputana and Central India, the Central Pro-vinces, the Panjdb and Berar. The imports, which amounted to 122,006 cwt., were mainly derived from Rajputana and Central India, Berar, the Panjab and the Central Provinces, while small quantities were obtained from Calcutta Bombay port Bombay Bengal and Karachi from Calcutta, Bombay port, Bombay, Bengal, and Karachi.

A small trans-frontier trade exists with Tibet and Nepal, to the former of which 1 cwt. was exported, to the latter 649 cwt.

As already stated, the unregistered road traffic probably causes the imports to be considerably underestimated.

7. PANJAB.

/. **YAINJAB. References.**—Baden Powell, Pb. Prod., 477-496; Cotton Repts. by Agr. Depts.; Rept. by Dir. Land Rec. and Agri., Panjab, Dec. 1889; Rev. and Agri. Dept. Repts. in many passages; Settle. Repts.:—Haeara, 88; Kohat, 124; Bannu, 80; Dera Ismail Khan, 347, 34& S Dera Ghazi Khan, 9; Jhang, 84, p/, 92; Montgomery, 107; Lahore, 8; Gujerat (App.), xxxviii; Kangra, 25, 27; Rohtak, 192; Gazetteers.—Dera Ismail Khan, 127; Dera Ghazi Khan, 82; jhanif, H2; Muzaffartrarh QI; Multan, 97; Montgomery, 112; Lahore, 82, 97; Gujerat, 78; Gujranwala, 52; Shahpur, 65, 75; Gurdaspur, 57; Hoshiarpur, 92, Mil; Ludhiana, 137; Gurgaon,8i; Kama 1₁ 17 2 \ Agri. Hort. Soc. of India, Journals {Old Series}, VIII., 1371 XIII., Proc. xiii.; Select papers from the Agri. and Hort. Soc. of the Panjdb, I. (up to 1862), 48, 64, 123, 105.106, 158-160.

REVIEW OF THE AREA, &C—The total area under cotton in the Pan-jåb in 18S8-89^{was} returned as 759,465 acres. In the year under consideration, a marked decrease in area is noticeable, but this is owing to exceptional climatic causes. On the whole, the cultivation is yearly increasing. Thus, during the three quinquennial periods of the past fifteen years, 837,600 acres, and for the third 859,800 acres.

The total outturn in the year under review was returned as 931,824 cwt., an exceptionally high outturn in comparison with the figures of acreage. Deducting the net export from that sum the total amount available for local consumption during the year is seen to have been 637,737 cwt. This figure, however, is liable to several sources of error. The returns of outturn per acre vary inexplicably in neighbouring districts, and are probably, m some cases at least, erroneous. Here, as in the North-West Provinces, the absence of a regular system of registration of road traffic may have given rise to some considerable error. While, in the North-West Provinces, the imports are probably under-estimated, in this province on the other hand, the exports by road, if registered, would in all probability much augment the figure of net export. If, however, the amount available for local consumption be accepted at 637,737 cwt., the

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Area. 170

GOSSYPIUM	,	Cotto	n Cultivation ir	n the	
CULTIVATION in the PANJAB. Area. Districts. 171	head, equivalent to about 16 yards of cotton. Perhaps this figure may not be much above the truth. To of the Panjab necessitates a large amount of clothing; the almost entirely cotton, and padded coats and quilts are we ployed by all classes of the population.				The cold climate e cloth used is ery largely em- he largest areas
		District.		CR COTTON. Mixed.	Outturn of cleaned cotton. ¹
	Gurgaon Rohtak • Karnal • Montgomery • Um'oalla • Multan • Jullundur • Sialkot • Lahore • Delhi • Shahpur • Dera Ghazi Khan Ravval Pindi		Acres. 81,700 45.863 28,158 47,827 52,562 17,393 27.225 41,982 29,500 32,77< 32,282 25,466	Acres. 31,222 2,805 9,⇔75 499 *••	Cwl. 116,714 98,760 61,329 65,367 57,243 46,056 43,593 42,612 41,232 39,509 35,259 34,944 27,285
Races. 172	cially in the group between G. Wig	up of •• Ben htianum, <i>T</i>	gals," may be b od., and G. ne	otanically considered states of the second states o	ncluded commer- dered as hybrids or G. arboreum. amining shew a

Specimens, which the authors have had the privilege of examining, shew a much greater tendency towards G. neglectum or G. arboreum than do the Hinganghat and Berar cottons, which are nearly pure G. Wightianum.

Mr. Drummond, Deputy Commissioner, Karnal District, writes, "The standard name of the crop in the Panjab proper is karpas, pronounced in most of the local dialects karpa. But in the tract between the Sutlej and the Jumna, except in certain minor portions which conform to the PanjAb rather than to Hindustan, or where there are (?) Sikh settlers (as in parts of the Hissar, Karnal, and Umballa districts), the name of the crop is *bari*. The seeds are known apparently everywhere in the cis-Indus tract as *banaula* or *banauli*. The ordinary name for the actual cotton is generally *ru* or *tut*, but this word is primarily applicable to fluff of any sort, whether of animal or vegetable origin. The wild Gossypium of the Theorem. Thanesar country is known to the Brahmans and Hindu Rdjputs as nurma, 'n allusion possibly to its ritual use, or to the purity of the snowy bolls."

Several forms occurring locally are known by distinct vernacular names» Among these may be mentioned the *nurma*, above noticed by Mr. Drum-mond, and frequent in other districts. It is said to have a red flower, £nd a greenish seed, both of which characters distinguish it from the ordinary field crop, of which the flower is yellow, and the seed grey. This so-called wild cotton, occasionally cultivated, is probably a form of G. neglectum, Tod., though the Deputy Commissioner of the Ihang District believes it to be of Egyptian origin.

L he Pan jab-Himalayan forms appear to be hybrids between G. arboreum and G. Wightianum. AitchisoiVs 462, collected in the Kuram valley, is G. 172

Conf. with pp. 7,28.

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also of this nature, having a strong strain of the former. A specimen col- lected during the Gilgit expedition (No. 250) is, perhaps, the nearest ap- proach to G. herbaceum, which the authors have seen from any region within the Indian botanical area.	CULTIVATION in the PANJAB. Races.
Mr Drummond, in an interesting note on the cotton of his district kindly furnished (o the authors, writes : "The mass of the scrub of the Nardak is <i>Dhdk</i> (Butea frondosa), but species belonging both to the Siwalik and the Deccan type of flora respectively occur, and among these is a species of Gossypium, which I am satisfied is indigenous, or at least spontaneously produced from a remote antiquity. This wild cotton is well known to the modern inhabitants of the Nardak, by whom it appears to be called in their vernacular • <i>narma</i> * or ' <i>ban-narma</i> ,' and the* staple is used by preference for making up the sacred thread of the Kulchattar Brahmans. ³⁻ The plant referred to is, in all probability—like the" <i>narma</i> ⁹³ already mentioned—G. neglectum, <i>Tod</i> .	Wild Cotton in the Panjab. 173. Conf. with p. 28.
The same writer continues, "In the Karndl district the cultivators do not appear to distinguish with any precision special races or breeds of the cotton plant, but more than one race undoubtedly occurs. A red or pinkish flowered kind is not uncommon " (probably a cultivated form of G. neglectum) " in the Panipat Tahsil, and in parts of the Karnál sub-collectorate. The Nardak field cotton is barely distinguishable, ex- cept as regards its habit, from the wild Gossypium of the neighbouring thickets.	
"The spontaneous form has an almost zig-zag stem, and a rather flexuous habit, which obviously contrasts with the rigid and twiggy ap- pearance of the cultivated shrub. This habit is doubtless determined by the usual manner of growth of the wild cotton, which generally springs up inside a clump of <i>huin</i> (Capparis sepiara, <i>Linn.</i>) or some other of the prevalent shrubs."	
During the past twenty-five years experiments have been steadily con- ducted with exotic seed. It is unnecessary, in this place, to enter into an exhaustive consideration of these; for a full account the reader is referred to Baden Powell's <i>Panjab Products</i> , 488-496, also to the Panjab cotton reports. Suffice it to say, that Mexican and New Orleans seem to have promised well, while the Sea Island, Egyptian, and Nankin races did not succeed.	Exotic Cottons. 174
In 1875-76 attempts were made to introduce Hinganghat, but, appa- rently, with little success, for we find the Deputy Commissioner of Rawal- pindi reporting, "The people do not care for this variety, as they consider the cultivation costly and the yield scanty."	
SOILS AND METHOD OF CULTIVATION.—The soil of the Panjdb appears generally to be well suited for the cultivation of cotton, if irrigated or low- lying and subject to inundation. Thus, Mr. Berkely, in an interesting report on experimental cotton cultivation near Delhi, writes, "The selection of the soil is by no means a difficulty; all varieties of equally productive soils have appeared to me equally well adapted for cotton. Thus, for Instance, wherever sugar-cane, wheat, or gram grows luxuriantly, it may be expected that cotton will thrive equally well."	Soils. 175
In the report on the settlement of the Jhang district it is stated that the crop grows best on the <i>utdr</i> wells in a strong loam.and that it does not succeed on <i>saildb</i> lands. Perhaps one reason for this is that the mode of cultivation in the latter is more slovenly, but even on good wells in <i>saildb</i> lands the crop is said to be always lighter than in the uplands. Manure is frequently, but by no means always, applied. The extent G. 176	Methods. 170

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Methods.

Cotton Cultivation in the

to which irrigation was employed in cotton lands during the year 1888-89 may be most conveniently shown in the following table:—

IRRIGATED BY		 Flooded lands.	Dry lands.	
Canals.	Wells.	Flooded failus.	Diy failus.	
Acres. 231,900	Acres. 186,900	Acres. 21,600	Acres. 3»5,900	
			l	

The following extracts from Settlement Reports and Gazetteers may be quoted, as describing, with a fair amount of accuracy, the methods followed in the more important cotton-growing districts:— "

In the Gazetteer of Gurgaon it is stated that :—" Cotton is sown on wells or where there are other means of irrigation, and on rain lands as soon as the first rain falls. The land is generally ploughed three or four times, the seed is sown broadcast, having been first rolled in cow-dung, so as to separate the individual seeds: about eight seers go to the acre. Cotton sown on wells has to be watered every fifteen or twenty days until rain falls; weeding is required three or four times; ten labourers will weed half a bigah a day for one rupee."

In the report on the settlement of the Jhang district, a long account of the methods pursued in the district occur, from which the following may be quoted :--- "The cotton of Shorkot, grown on the utdr soil, irrigated during the hot weather months from *jhallars*, or by inundation from canals, is very good. Land intended for cotton ought to be ploughed up once beforehand, after the cold weather rains. It is then manured; all cotton land ought to be manured, but a good deal never is. The manure is spread and the first watering is given. If the *zamindar* is lazy, he sows the cotton seed smeared in cow-dung broadcast. The land is then ploughed twice and rolled. If the*zamindar is industrious, he will plough the land twice to cover in the The well beds and water channels are then made. In Chiniot seed. cotton is sown much earlier than in the two southern tahsils. Sowings are made from the end of *Chait* to the middle of *Jeth* (April and May). About 32ft of seed per acre are used. Early sown cotton is ready to pick in Bhadron (August-September) ; all Blwdron pickings belong to the tenant. The proprietor does not share in the pickings before the 1st Assin 1 September-November) and he takes nothing after the Lolnr festival, the 1st Magh (January/February). There is not much left after the 10th January, but what there is the tenant takes. Very little *mud hi* cotton is grown in this district. There is not enough rain. Cotton is hardly ever grown alone. Melons, *jowar*, *mandua*, *kangnia*, *swank* are almost in-variably found in the cotton fields. Melons are sown with the cotton. The other crops are sown later on and are used principally for fodder. Jowar is hardly ever allowed to ripen, and the writer cannot remember ever having seen an instance of the other three crops ripening, the reason being that they are sown where the soil is hard and saline and not well suited for cotton. Hence the cotton is light and the deficiency is made up. Jby the associated crop. In this district the crop is not usually ploughed after the bushes have reached some height. The fields are hoed and weeded and the jotnav or other seed is then scattered broadcast in between *e cotton bushes. A watering is at once given and the seed usually germinates. Less mandua, kangni, and swank are grown in Chiniot than in the other tahsils. During the hot months cotton is watered every sixth day. In the early stages cotton is liable to be injured by drought and hot winds. Too much rain is also injurious to cotton. In 1878 the

rains were very unfavourable and the cotton on well lands ran greatly

to wood. The bushes were very fine, but the outturn was nothing more

Daniah	(Watt P Marman)	COSSUDIUM
Panjab.	<i>{Watt & Murray.)</i>	GOSSYPIUM.

in the PANJAB. than average. The Uela' blight also attacks cotton. Early frosts do Methods. more damage than anything else. Two kinds of cotton are grown in this district, but the red-leaved plant is not often seen. The ordinary country plant is the most common." The following description of the methods employed in Shahpur is also of interest, and may be quoted: "Cotton has always been very largely grown in this district. Few wells are without their patch of two or three acres of the plant. More than this cannot ordinarily be set apart for its culture, as it is a crop that requires constant attention in weeding and watering. The seed is put into the ground in March at the rate of eight seers (16 fib) to the acre, and the pickings give an average of about one anCl a half maunds of cleaned cotton per acre. The same plants are often made to yield three crops, by cutting them down level with the ground each year after the cotton has been gathered; at the same time the soil is well ploughed up between the roots and manured." Mr. Drummond, Deputy Commissioner of Karnál, has kindly furnished the following account of cotton cultivation in the Eastern Districts of the Panjab :-" In the Nardak, country cotton seems to have been cultivated from an ancient period. It is usually sown on up lying patches (ordinarily clearings, or paddy reclaimed), on the edges of the water hollows, and watered by lift from natural hollows, or excavated reservoirs, or from aqueducts led out of these. In some cases these are fed from branches of the Sarsuti and Chautang, on which numerous wide dams and similar works have been made to Facilitate watering for different crops, but pri-

marily rice, none of these being probably of high antiquity. "Wells in the Nardak are rare, and confined for the most part to the environs of the village homestead. The cotton cultivation of the Nardak, in so far as it depends on these wells or on outlying wells, whiciV are almost all of very modern origin, is an innovation. In fact, it is not uncommon to find the husbandman irrigating his cotton plots from the village tank, though they may grow within a few yards of a well, which is reserved for the tillage of manured wheat or tobacco.

"This is a very different condition of affairs from that which prevails in other portions of the district, where cotton is now grown. In the Khadar of the Jumna the cotton crop is mainly dependent on wells worked usually with the Persian wheel. In the belt again between the Jumna valley and the Nardak (comprised in the Bangar of the Karnal and Panipat tahsils), the cotton is almost entirely dependent on the Western Jumna canal

•' Wells in the Nardak are, of course, restricted by the great depth of the water level, which slopes from 50 feet below the surface in the north of the Kaithal sub-collectorate, to over 150 feet in the south west corner of the same sub-division. The Nardak cotton is, perhaps; consumed almost entirely on the spot: but the canal-irrigated and Jumna valley outturn goes to swell the Khadar cotton supply of the Delhi market.

^{*u*} Khadar ovKhadir cotton is a commercial term for the produce of the districts (in the Panjáb and North-West Provinces) on the Jumna from Umballa to Delhi, both inclusive.

 $\bullet_{\rm B}$ "In the Eastern districts of the Panjáb, cotton is grown on all but the lightest soils, but it prefers the more tenacious loams. It requires copious watering and certain seasons, but unless the water be drained off naturally or by artificial means at the proper juncture, the flowers and, consequently, the pods, will suffer. Hence the Khadar is always more speculative than the result in the canal-irrigated uplands, or in the Nardak, notwithstanding

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Cotton Cultivation in the

CULTIVATION in the PANJAB. Methods.

the fact that the cultivation in the last-named tract is so primitive in its character. On the other hand, too strong a sun when the buds are forming is most adverse to the field. The plants, if exposed at this stage to an excess of moisture, are drawn out and run to stalk. The blossom is then sparse and light, and of flowers produced, only a portion mature pods.

•' The usual time for sowing in the Jumna Khadar and the neighbouring uplands is just at the first heavy burst of the periodical rains, or from about the 20th of June to the 10th of July. But on land commanded by wells the seed is sometimes put in earlier. The practice of sowing in March or even earlier, which is reported from some districts of the Panjáb seems to be unheard of in the Eastern districts. In these the wells and labour are not set free for cotton before April.

"Cotton is also raised as an unirrigated crop in parts of the Karnái and other Eastern districts, but nearly always in such a situation" that the young plants can be watered, at a pinch, from a tank, or by catchwater drains leading from the waste. It is only in a specially favourable season that a cotton-patch can be left to the unaided rainfall. In the Eastern Panjáb the soil is not always manured for cotton. In the Khadar it is often sown on what is known as *sail aba* or spongy land, too far from the village site for the transfer of manure. In the Nardak the grey loam does not require more manuring than it receives indirectly from collections of flocks and herds at particular stations; possibly the soil contains particles of lime washed down from the Himálayan formations near which the hill streams originate.

^w The pods are picked from November to January. Near towns, and especially the large town of Panipat, the picking forms an occupation fur the women of the more industrious classes of the cultivating lower orders. The hire is sometimes paid in cash; more frequently as a proportionate share of the day's gathering.

•• The plan of sowing certain leguminous crops (chiefly species of Meli-*lofts and Trigonella) with the cotton, as an after-crop to be used as fodder for well bullocks when the natural grass begins to fail, which is pretty general in the Central Panjáb, seems to be unknown in the Eastern districts. This fact is probably due to the comparative richness of the pasture and the greater area of waste and fallow which still prevails, especially in the Karri'al and Hissar districts.

"Cotton mixed with other crops is commonest in the Khadar of the Jumna (til_9 melons, and certain autumn pulses are the crops most commonly sown with it), but throughout the Karnil district, and generally in the Eastern districts, san (Hibiscus cannabinus, Linn) is, as a rule, sown in strips along the edges of the cotton pastures, or in alternate ribbons with the main staple. The Karnái cultivators assign several explanations, more or less reasonable, for this practice, but cotton when so treated seems undoubtedly to have a better chance than when unprotected. Possibly the tall stems of the Hibiscus help to moderate extremes of sun-light and wind, but the primary object, as in the parallel case of gram being edged with kasumbha (Carthamus tinctorius), is likely enough to keep off antelopes and cattle, which the traditions of the Dharmdharti (home of *he law, or Aryavartta) do not permit to be kept of! by more vigorous measures.

"Jⁿ the eastern portions of the province cotton is one of those crops to 2215^{h} the system of agricultural association *{Una}* is almost universally applied. Indeed, in those tracts in which the wells are over 40 feet in depth (in such districts as Karnál and Hissar), the cultivation of cotton, except by the combination of ind*vidual resources in the way of oxen, implements, and labour, would scarcely be practicable."

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{Watt & Murray) GOSSYPIUM.

CULTIVATION PICKING AND CLEANING.-The following is extracted from a monoin the PANJAB. graph on cotton manufactures in the Panjáb, 1883-84 :--- "Cotton is picked about November and December. The pods do not all ripen at the same time, and it is therefore necessary to go over the field several times. This work is chiefly performed by women. They are usually paid by a Picking. portion, generally one-tenth, of the cotton they pick. The pods are ex-177 posed to the sun and beaten to make the husks *{doda*} separate from the fibre. "The seed to which the fibre is attached is then extracted by a small hand machine which takes the place of the cotton gin. 1 his consists of two rollers, one of which is generally of iron and smaller than the other, which is of wood; but in some districts both rollers are stated to be of wood. By means of a spiral turn at the end of the iron roller, which engage's a projection of the wooden roller, the two are made to revolve in opposite directions when the handle attached to one of them is turned. The fibre (*rut*) is drawn through the rollers, while the seed {*binola* or *varema*), which cannot pass between them is left behind. This machine, which is called *belna*, is capable of ginning about 12 seers of cotton in a day. At Mult an a steam cotton gin has been established . • • which employs 70 persons. 'In the Hazara district there are at Pakhli some *belnas* worked by water power. The *belna-vrovVer* is commonly paid by receiving the cotton seed which he extracts, but sometimes receives cash. The operation is also very frequently performed by members of the household of the person to whom the cotton belongs. In the census tables 3.257 men and 1,345 women are recorded as cotton ginnes, but these figures do not represent the numbers really so employed. The cleaned fibre usually weighs one-third, the seed two-thirds, of the whole contents of the pod, but with, inferior cotton the fibre is sometimes only one-fourth of the whole.' SEASONS OF SOWING AND PICKING.—The period of sowing occurs at dif-Seasons. ferent times in different parts of the province, and is also largely regul_:texl< X78 by the rainfall. In Gurgaon it is sown on wells, or where there are other means of irrigation, from March to May, and on rain lands in June-July, as Foon as the first rain falls. The early-sown cotton begins to bear in August-September, the later in October-November, the plants continue to bear till they are killed off by frost. The early cotton has thus the great advantage of ripening a month earlier than the other, and of being generally able to bring out all its pods before the frost comes. If the rains or hot westerly winds are excessive, the pods are said not to ripen. In the Shahpur district the seed is sown in March, but the process of gathering does not commence till October and lasts till the end of December or even later. In other districts of the Panjdb, sowings, as a rule, go on from the middle of February to the end of March, and in well-watered lands to April and May; on all rain lands they are much later. Picking ought always to be completed before January, owing to the danger of loss from frost. The crop is sent to market from January onwards, and is available for export, according to the means of transit, from January to May or June. **DISEASES.**—Dr. Johnstone, in a valuable note on the blights of cotton Diseases. communicated to the Agri-Horticultural Society of the Panjáb, described 179 the crop as liable to four special pests, viz., (1) the larva of Helicopis cupido, which attacks the young plant; (2) the larva of Deprescaria gossipiella (weevil) which infests the seed in harvest and is known as the "toka" by the natives; (3) a large hairy caterpillar (bhungo) which attacks the leaves and stem on the approach of the rainy season; and (4) an Aphis which frequently attacks the crop in great quantities, and has, on several

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GOSSYPIUM	•		Cotton	Culti	vation	ı in	the	
CULTIVATION in the PANJAB. Diseases. Yield. ISO	occasions, g plant by its ised by with Accordin more readil to the appea land least of Dr. Joh efficient cura (1) Th (2) Th (3) Th (3) Th (4) R (4) R (4) R (5) (4) R (5) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	ravages i hering of t ing to Dr. y than or arance of f all. instone s es for thes he larva o ashes over he weevil he large c preyed of attain larg picked off egarding ing staten in the pro- that hemp cotton. T warding I action of s tion befor rthy of no of the pro- tion befor rthy of no	ninished is known he leave Johnst n others, the inse states th se blight f Helicoj r the you can be k aterpilla n by sta ge numbe the plan the Aph nent that oximity of p should The Depu Dr. Joh san hem e being a te, in con covince a , the Muz ula, a bli soil becoon on in the S.—The province	the h to the h s and one t hard, ct, sof at the s: — pis cuj ing pl illed h r, <i>bhu</i> arling ers an is Dr '' it d of <i>san</i> be p uty Co nston p dese accept nection row zaffars ght th ming pod. yield j , bein	arves le Par final he Ap comp t, dar e folle pido r ant. by sca ngo, s and d becc hand . Joh oes n hem lantee ommis e's ne cribed ted as on wite of san garh c at be wate per ac g retu	st. njáb ly b phis pact np, owin nay ldin has ot ot ot ot ot ot ot ot ot ot	The disease provises as <i>thela</i> . and by the death of attacks crops thand being n loamy soil less ing methods of be put to fligh ing the seed with many natural of her birds. If, every destructiv one makes the exist in any cot ond consequent ere and there her of Gujerdt, I states that in the latter requiparts or Johnstone's sowed round the ict to be subject s at the stem an gged (<i>soma</i>); I appears to vary d as 260ft to the ng been only 80	on certain soils lost favourable so, and sandy treatment are t by sprinkling
	acre is obtai above that	ned, an av returned f owing are	verage a for most given as	little l other s the	ower parts avera	than of 1 ge (n that of Sind a India. outturns per acı	re (for 1888*89)
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		DIST	FRICT.				Unmixed.	Mixed.
	Gurgaon . Rohtak . Karnal . Montgomery Umballa .		• •	•		•	ft 120 240 260	ft
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Panjab.

{Watt & Murray.) GOSSYPIUM.

Mr. **Drummond** has kindly furnished the following note in explanation of the variation in the figures of yield per acre : ^M This varies, through-CULTIVATION out the province within wide limits, and even in the same district marked differences exist. A good Khadar plot, properly manured and steadily irrigated from a well, in a good season would probably produce as much as 4.00ft to the acre. On the other hand, a Nardak patch, on which the same crop has been raised for some autumns in succession, will yield so little, should the reservoirs, from which it is usually watered fail, that the cultivator will not even expend, in picking it, the menial labour for which there may be a demand in some other direction. But the average outturn per acre in the eastern districts \n an average season should probably not be placed below 2009>."

£OST OF CULTIVATION.—Details are given in the subjoined extracts from the Provincial Cotton Report for 1882-83, but, judging from the remarks thereon they do not appear to be very reliable. It is to be regretted that no more recent statistics are available*:-

"The following tables show the cost of the cultivation of cotton in those districts from which detailed estimates have been furnished, distinguished, according as irrigation and manure are, or are not, together or separately applied; also a detail of the cost of each agricultural operation on that class of land in which the cultivation is most complete, that is to say, land which is both manured and irrigated :-

Statement showing" the cost of cultivation of cotton in certain districts under the four heads A, B, C, and D, i.e., irrigated and manured, irrigated but not manured, unirrigated but manured, unirrigated and unmanured.

DISTRI	ICT.	А.	B.	C.	D.
Delhi . Gurgaon , Karnal . Hissar . Rohtak . Ambala , Ludhiana . Jalandhar . Amritsar . Gurdaspur , Lahore . Gu jerat Multan . Hang . DeraGhazi Khan		R $a. P.$ 31 3 7 $20 \cdot 3$ 0 23 23 10 0 17 0 0 17 0 0 17 0 0 14 3 7 29 2 9 23 0 10 37 13 4 27 6 4 24 10 0 20 6 0 $\ll 7$ 1 0 10 0 9 24 0 3 22 12 6	* a. $P >$ 24 13 4 "7 11 0 19 9 6 n 3 10 21 2 10 17 15 5 30 15 6 18 9 6 21 7 0 12 4 0 15 7 0 12 4 0 15 7 0 10 6 5 8 5 3 16 7 6 12 5 0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	* a. P- 14 1 3 8 12 0 8 10 9 8 8 0 6 8 7 13 7 2 10 3 5 17 11 n 9 0 2 '3 10 0 5 5 0 8 5 0 7 12 10 5 1 0 7 6 3 6 2 6

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in the PANJAB.

Yield.

Estimated Cost of Cotton	Cult	nation und	ar Class	<u> </u>	dod and		l) of acc	h agricu			those di	CULTIVATION PANJAB Cost.
	rom		detailed		nates			furnishe		<u> </u>	mose ai	
<u> </u>	Delh	i. Gurgaon.	Karnal.	Hissar.	Rohtak.	Ambala.	Amritsar.	Gurdas- pur.	Lahore.	Gujerat.	Montgo- mery.	Dera Ghazi Khan.
	କ୍	8 d	<i>R</i> a. <i>p</i> .	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.	R a. p.
I. Ploughing before sowing		1	600	300	0 01 t	4 4 9	2 13 0	400	100	300	I 4 0	180
a. Manuring before sowing	<u>-</u>	}	280	280	3 3 6	53 a	6 1 4	100	100	0 14 0	139	3 3 0
3. Watering before sowing .	(Joda	1	400	200	0120	260	380	200	100	I 12 0	140	0 10 9
4, Seed and its preparation for sowing.	Detail is not given in the report.	Ditto.	040	100	069	0 11 9	088		050	050	033	011 3
5 . Sowing	en i			080	143	0 10 0	070	020	100	0 10 0	I 4 0	0 is 9
6. Watering after sowing.	tgi			300	0 14 0	3 5 a	5 a 8	400	600	4 0 0	1060	3 5 3
7. Hoeing and gleaning .	s no	Ditto	1 ia 0	200	18 a	407	a 0 8	300	a 1 0	100	1 a 0	196
8. Manuring after sowing	aili	A		100	1 3 5	080		100	a 0 0	080	030	300
9. Picking	Det		2 11 6	100	1 12 0	3 13 7	3 6 0	540	3 0 0	300	a 13 10	300
o. Cleaning			666	100	196	4 3 9	380	3 1a 0	300	300	445	4140
TOTAL	3i 3	7 20 13 0	J2 10 0	17 0 0	14 3 7	29 2 9	27 6 4	24 10 0	ao 6 0	17 1 ©	34 0 3	23 12 6
	M. S.	C. M. S. C.	M. S. C.	M. S. C.	M. S. C.	M. S. C.	M. S. C.	M. S. C.	M. S.C.	M. S. C.	M. S. C.	M. S. C.
Produce per acre	6 0	0 300	4 ao 0	3 20 0	200	600	4 10 0	500	400	200	4 30 0	400
	R a.	p. R a. p.	R a.p.	* a. p.	R a. p.	R a. p.	R a. p,	R a. p.	R a. p,	R a. p.	Ra.p.	X a. p.
Cost permaund of uncleaned cotton.	5 3	3 6 15 0	540	4 14 0	719	4 13 9	671	4 14 10	516	886	554	5111

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Cost.	CULTIVATION
Estimated Cost of Cotton Cultivation under Class A (irrigded and manured) of each agricultural process in those districts of the Pan jab from which 'detailed estimates have been furnished.	of

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	Panjab.	<i>{Watt & Murray.)</i>	GOSSYPIUM.
the tahsildars of his district return must be furnished A, B, C, and D, which the cient regard to the real standard stan	ct, under the imp for cost of cultiv he prescribed for tate of the fact, and in that distr ave been made of the crops to whice certilising materia these, he will not e exceptions, and al Pindi Division mirrigated land, hates differ widel this report, and To take the Ka ore sowing is now re, and those of inst Ri2, Again watering or ma rged in the form evious to sowing espectively. The ces; but since the thitons, $V \pounds B *_{g}$ plou is said to be in a ar's figures are a The produce pe is given as onl , for the result h is thereby raised e loser, as a comp same districts wil urnished the follow anjdb is peculiarl co-operation to v The calculation al Department ap e, ploughing ana ivating owners an	rgarh, Mr. Gladstone, finds pression, apparently, that s ation under each of the h m contains, have not paid s which is that cotton is n ict. It is not impossible f the returns of other locali ch the zemindar devotes all al at his command, and un attempt the cultivation at among them may be instan n, where this crop is lar three crops being often ta y from one another, and to d in the former one do arnál estimate, for example v reckoned to cost only Ro picking and of cleaning to n, nothing is put down in nuring after sowing, for w er calculation, but the co g is increased from R1-4 district report contains no the cost in Karnál, as repod ghing and cleaning, was, ny other district, it may be a nearer approach to accur r acre of uncleaned cottor y two maunds. This is ing cost of production l to a figure which would I parison with the prices per l show.'' wing note on the subject of y difficult to estimate, owing which reference has been n is usually furnished from pear frequently to include manuring cannot be said ad fixed tenants of the Eas	In the PANJAB.eads suffi- ever that ities.Cost.costCost.ities.I the red gely akenhose not gely akenNo a costhose not of an eave cwt.A costof a and costA costin the racy n in evi- of a costA costg for nade the too d toA cost
" On the other hand, i	f the cost at whi	ch a capitalist could effect here are several items w	

same taken, then there are several items which should be included in addition to the value of labour; notably a proportion of interest at the market rate on the original cost of well-sinking, and otfier items which the zemindar would recognise as included, such as the share given in kind to menials and artificers for their general contribution to his farming work. Where Persian wheels are used this is a material consideration.

*' In the case of villages which enjoy canal irrigation from the Western Jumna Canal, the cost of irrigation can be pretty accurately estimated and if to this important item, there be added an estimated figure for the value of labour and depreciation of stock, and a further percentage taken for miscellaneous expenditure, the cost per acre of raising uncleaned cotton

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GOSSYPIUM	1. Cotton Cultivation in the
CULTIVATION In the PANJAB. Cost.	fit for the Delhi market (and excluding, therefore, cost of delivery to the broker) cannot exceed Rn or R12 at the utmost. The market value of the manure, if added, would hardly bring the total estimated cost to more than R13 or R13-8.
Panjab Trade. 182	ANALYSIS OF LAST YEAR'S TRADE.—The total exports in 1888-89 amounted to 295,976 cwt., of which 96,281 cwt. went to Bombay, 44,121 cwt. to Karachi, 42,123 to Calcutta, and 108,988 cwt. to other provinces and presidencies. Of the last mentioned quantity much the greatest propor- tion went to Sind, smaller quantities to the North-Western Provinces and Oudh, Bengal, Bombay, and Rajputana. As already stated, it is highly probable that a considerable unregistered export road trade exists between the Pan Jab and the North-West Provinces, more particularly Agra. In addition to the above, 1,304 cwt. were exported across the frontier to Kash- mir, and 3,159 cwt. to Sewestan, Tirah, Kabul, Bajour, and Ladak.' The total imports were very unimportant, amounting in all to only 1,889 cwt., to which the North-West Provinces and Oudh, Rajputana, and Central India, Sind, Karachi, Calcutta, and Bengal contributed small quantities, while the largest amount, <i>vis.</i> , 880 cwt., was imported across the frontier
CULTIVATION in the	from Kashmir. 8. CENTRAL PROVINCES.
Area. 183	 ReferencesRept. on Cotton by Chief Commissioner, C. P., Sept. 49, 5 Carnuc, Rept- on operations of Cotton Dept., 1867-1869; Annual Reports of Cent. Prov. and Berar Cotton Dept.; Reports, Agri. Dept.; Cotton Reports, Rev- & Agri. Dept.; Exp. Farm. Reports; Administration Reports in many passages!; Settlement Reports :jubbulpore, 871; Chanda, 81, 9699, u3; Wardah, 63, 67,75; Raepore, \$6; Nursingpore, 53f Baitool, 77; Saugor, 3; Nimar, 1, 193-195; Nagpore (Supp.), 272; Upper Godavari, 36; Morris, Godavari Dist,68; Gazetteer (1870), 6, 64, 115, 13I, i36, 168, 204, 212, 327, 331, 365,417, 516; AgriHort. Soc. of India, Transactions, V., Proc, 65; Journals (New Series), I., Proc., Ixt. REVIEW OF THE AREA, OUTTURN, AND CONSUMPTIONThe total area ueder cotton in these provinces during the year 1888-89, as will be seen from the table (p. 56) was 613,348 acres. As already stated in commenting on the facts regarding Hinganghdt cotton, the area has markedly fallen off within the past twenty years. Thus, about fourteen years ago, the cultiva- tion averaged 800,200 acres, five years ago it dropped to 688,400, while in the last five the average has only been 608,800 acres. The total outturn in the year under consideration was returned as 351,923 cwt. of cleaned cotton, giving an average yield to the acre of 64*2%. A comparison of the total imports from all sources, 8,756 cwt, with the total export, 170,130, shews the net export to have been 161,374 cwt., which, when deducted from the above given total production, leaves 190,549 cwt. in the provinces for local consumption. When distributed over the population of 9,838,791, this amount gives an average per head of nearly 2"2fc, or, taking Indian cotton cloth at 4\$ yards per ft, about 9*5 yards of cloth to each individual. In giving the above figures calculated from available information for one year, however, it would be urged that in these provinces, as elsewhere, they are only approximations, and are open to several sources of grave error. Thus, in a c
	 of area on which it is compiled are in most cases only estimates, and sometimes extremely rough ones. 2nd—That, granted the estimate of production is correct, the conclusions as to its consumption are justified only on the assumption that the exports and imports by road, of which no statistics are available, balance each other.
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CULTIVATION in the CENTRAL PROVINCES. 3rd—That the years of production and of trade statistics do not correspond. An interesting calculation, subject, however, to the above errors, is made in the same report, from which it would appear that the total consumption Area. per head in these provinces, of local and imported cotton and cotton cloth, is approximately 3*18ft, while the production per head is 3*22fb per head. This shows that, on the whole, the provinces consume as much as they produce. A considerable portion of the amount above calculated as available for local consumption is annually consumed by the cotton mills of the province. of which there are three. Thus, in 1889, these mills are stated to have worker} up 91,021 cwt. of raw cotton, leaving approximately 100,000 cwt. for hand-loom manufactures, mattresses, wicks, &c. DISTRICTS WHERE GROWN.—The cotton country of the Central Pro-Districts. vinces lies on the left bank of the Ward ha river. In the north, where the **I84** river debouches from the Satpura Hills, the cotton cultivation covers a rich but narrow strip along the bank. This strip widens as it proceeds southwards until it ultimately attains a width of some 50 miles. The wellknown mart of Hinganghat may be said to be situated where the cotton field is widest; but the whole plain, though capable of producing cotton, is not entirely occupied by it, for wheat and joixari alternate with cotton fields. After reaching its greatest width, the cotton country again narrows, until at last, in the south of the Chanda district, it is lost in the encircling brushwood and jungle. The districts in which the cotton crop is of most commercial importance, are Nimar, Wardha, Chhindwara, and Nagpur. The rainfall in these provinces is very much lighter on their western border than elsewhere, and it is in the western districts that cotton is most profitably grown. In Chanda, which supplies the mart of Hinganghat with what is reported to be its finest cjuality of cotton, the kind known as *jari*, is also produced. The following figures represent the average area under cotton, during the three years 1885-1888, in the above-mentioned chief cotton-growing districts :----Unmixed. Mixed. Wardha (acres). .7,813 137.978 ²⁴>⁹⁵⁴ 881506 **JSMP**? ... Chhindwara " 23.041 26.508 Nimar 4SP97 1*278 Races. RACES OF COTTON.—As already stated the greater portion of cotton grown 1«5 in these provinces belongs to the growth known commercially as *Hinganghat*; indeed, this race is the only one of importance from a trade point of view. It occurs in two different forms, one of which is known as bant, the

ghat; indeed, this race is the only one of importance from a trade point of view. It occurs in two different forms, one of which is known as *bant*, the other as *jari*. The former is longer in staple and commands a price equal to that quoted for any other Indian cotton; the latter is whiter and freer from leaf but of poorer staple. Botanically, both races are forms of G. Wightianum, *Tod.*, the inferior form shewing degeneration through hybridisation with G. neglectum. in the remarks under G. arboreum a passage has Deen quoted regarding Seoni district, from which it will be found that G. neglectum is cultivated under the name *manua*, and G. arboreum as *deo* (p. 9). Here, as elsewhere, however, numerous experiments have been made with the object of attempting to introduce cottons of a higher class, In 1882-83, *Broach* cotton was planted at the Nagpur Experimental Farm, but the results appear to have been unsatisfactory. It suffered much from a drought which prevailed in that year, and afforded no remunerative yield. In 1883-84 experiments were commenced at the Government Farm with New Orleans (G. hirsutum), and Upper Georgian cottons (G. barba-19 G. 1885

Cotton with p. 9.

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Cotton Cultivation in the

CULTIVATION in the	
CENTRAL PROVINCES.	
Races.	

dense), which have since been continued with fairly good results. Parallel experiments were made with the fibre obtained from these and with that of the *bant and jari* country or *Hingangh&t* cotton, by the Managers of the Cotton-Mills at Nagpur and Hinganghat, with the following results :—

tive va- lueof: I Hand- ginned. Saw- ginned. Saw- gin Saw- ginned. Saw- ginned. Saw- ginned. Saw- ginned. Saw	Compara-	NEW OR	LEANS.	UPLA GEOR	BA	NI.	JAR	I
KKKKKKNagpur Mills7555757873705556HinganghatII	tive va- <							•
	Hinganghat	75	55	75	73		55	56

The above-cited figures are of considerable interest, shewing, as they do, how markedly the New Orleans form of G. hirsutum deteriorated in value after being saw-ginned, while the Upland Georgian, on the other han-dj was, if anything, improved by the process, and the Indian cottons were only slightly damaged. The high value of the better class of country cotton is also worthy of notice. A recent communication from the Manager of the Khandesh Experimental Farm contains the information that the , short-stapled *jari* now fetches almost as good a price as the *bani** ^{ow*n}£ to its containing a higher percentage of fibre to seed, and to its purer white colour. A continuation of the cultivation of American cottons demonstrated that New Orleans was unsuited for the climate and soil of the provinces, but that Upland Georgian was capable of yielding very satisfactory results. It was proved to give a fair crop,— 173 b^{on} manured, ana from 71 to 11 lib on unmanured land,—and to produce a strong, £^{ovc1} " staple superior to the best Hinganghdt. In 1880, over 1,000% of seed ot the Upland Georgian cotton were distributed to the rayats in the Wardha district, and the resulting crop appears to have been highly esteemed both by the cultivators and cotton dealers.

Mention is made in several reports on the cotton of the Central Provinces of a *khaki* cotton which is grown in small quantities, and is consumed locally, none coming into the market. This is probably Nankin cotton (G. religiosum. Conf. with pp. 16-17).

CULTIVATION :—SOILS, SEASONS, &C.—The following description of the " cotton soil" of the Central Provinces, extracted from the *Central Provinces Gazetteer*, may be of interest, since the soil seems to be one of the best in India for cotton cultivation, and, at the same time, appears to lend itself readily to the growth of one of the best races of American cottons :—

"The black soil or *regar*, or, as it is not uncommonly called, the 'cotton soil,' forms one of the most marked varieties in these provinces. It is the common soil of the Deccan, Malwa, Narbada valley, &c. It varies greatly in colour, in consistence, and, with these, in fertility, but throughout is marked by the constant character of being a highly argillaceous, somewhat calcareous, clay, very adhesive when wetted, and from its very absorbent nature expanding and contracting to a very remarkable extent, under the successive influence of moisture and dryness. It, therefore, becomes fissured in every direction by huge cracks in the hot weather. It also retains a good deal o moisture and requires therefore less irrigation than more sandy ground The colour of this soil, often a deep and well-marked black, with ever variation, from this to a brownish black, would appear to be solely due t< an admixture of vegetable (organic) matter in a soil originally very clayey

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(fentral Provinces.

(Watt & Murray) GOSSYPIUM,

CULTIVATION Thus, deposits of precisely the same character as this regar are being formed now at the bottom of every *jhil* in the country, and throughout the very area where the regar is best marked, it is by no means an uncommon thing to find the slopes of the small hills or undulations formed of more sandy reddish soil, while the hollows below consist solely of the finest regar. This appears to be due to the more argillaceous and finer portions of the decomposed rocks below being washed away by ordinary pluvial action from the slopes and accumulated in the hollows, where this finer mud forms a soil much more retentive of moisture, and which therefore rapidly becomes more impregnated with organic matter, and is often marshy. Regar can thus be formed, wherever a truly argillaceous soil is found, and its general, but by no means universal, absence over the metamorphic and other rocks is easily accounted for by the fact that these rocks for the most part vield sandy, not clayey, soils. It is never of any very great depth, and excepting when re-arranged by rivers in their recent deposits, is therefore never met with at any great distance below the surface.

*'Obviously formed from the re-arranged wash of the older and more widely-extended soils we find large areas of very fertile soil, consisting of clays rather more sandy than the older alluvium, and not therefore so black or adhesive. Though rarely formed altogether of the true regar soil, it frequently contains a large proportion of this mixed with other clays and sands. Every intermediate form of soil occurs, and it would by no means be an easy task to distinguish them all. From an agricultural point of view, it is interesting to see how exactly the limits of certain kinds of cultivation coincide with the limits of these marked varieties of the alluvial deposits of the country." (Central Provinces Gazetteer, 1870, xlvL, xlvii.). An analysis of the soil shows its composition to be as follows: silica, 48*2; alumina, 20*3; carbonate of lime, 16; oxide of iron, 1; water and organic matter, 4*3 per cent.

METHODS.—The soil is prepared for sowing in May to June/the seed is sown in June, picking commences in November to December, and is completed from February to March.

The following account of the method followed is extracted from the Central Provinces Gazetteer | 1870: "Cotton is sown and reaped about the same time as jowar. As it does not early obtain any considerable height it requires more weeding and banking up with the kolfa (bullock hoe). The process of gathering the pods is a most negligent one, most of them being allowed to drop and get discoloured on the ground. It is the worst feature, perhaps, in the husbandry of Nimar, but the cultivators urge in excuse, that it would not pay to keep people running up and down the cotton fields every day for a month or so, when so little is grown and the return The process of cleaning is the same as in other parts of the so small. country."

It is encouraging to note, that though the total area under cotton in the Central Provinces has diminished of late years, improvements are being effected in the methods of cultivation and gathering. Weeding is more carefully attended to than it used to be, and many[^] cultivators are said tq, have adopted a system of light, but careful, manuring, which, as noted above, greatly increases the crop.

YIELD PER ACRE.—The following figures are given by the Government of the Central Provinces as the average outturn of cleaned cotton per acre during the three years ending 1887-88 :-

Jabalpur, 36'48ft;Narbada,43-5₉ft, Nagpur, 6i'33lb; Chhattisgarh, 32'iofc.

In 1870, Mr. J. Q. Fraserof Gopalpur, Jaunpur, reported the results of cultivating Hir.ganghat cotton by transplanting from a broadcast sowing 131

in the CENTRAL PROVINCES.

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Yield. 188

GOSSYPIUM	I. Cotton Cultivation in the Nizam's Dominions.
CULTIVATION in the CENTRAL PROVINCES. Cost. 189	made in the rains. The yield was 376ft per acre of cleaned cotton. The reports on the samples published by the AgriHorticultural Society pronounced the staple to be very good, silky, of good length and strength, measuring a little over 1 inch, while the average Hingangh&t is 1*4 inch. COST AND PROFIT OP CULTIVATION.—It is difficult to arrive at anything like an exact estimate of the total cost of cultivation, and of the pront derived per acre. Assuming the value of the total production, however, to be proportionately equal to the value of the exports, we have 170,150 cwt. <i>i</i> 35*»9'3 cwt: 837,51*382 : 1*77,59,934: which last figure when divided py the total area gives an average value of Ri 1 per acre. The profit deriv-
Provincial Trade. 190	able from this sum would appear to be in most cases considerably les ^s than that from wheat, linseed, or <i>jowar</i> . ANALYSIS or LAST YEAR'S TRADE.—Of the total production of 1888-oQt w [*] »., 351,923 cwt., 170,130 cwt. is returned as having been exported. O [*] this, much the largest proportion went to the port of Bombay for export, 57,237 cwt. is shewn as having gone to the province of Bombay excluding the port, and smaller quantities to the North-West Provinces and Oudh, Berar, Rajputana and Central India, Bengal and Calcutta. The imports are unimportant, amounting to only 8,756 cwt. The chief amount was obtained from Berar, the North-West Provinces and Oudh, and Bombay
COTTON CULTIVATION in the NIZAM'S DOMINIONS. II Area. X92	Bombay. 9. NIZAM'S DOMINIONS. REVIEW OF THE AREA, OUTTURN, &c—The average area during the five years ending 1885-86 (the last period for which figures are available) was 1,016,565 acres, yielding 307,002 cwt. Statistics for road traffic not being available the net export can be approximately arrived at only from the statistics of rail-borne trade by accepting the road exports and imports as balancing each other. On this assumption the net export in 1888-89 was 81,84.2 cwt. of cleaned cotton. Taking for granted that the production in that year was approximately equal to the average of the five years a'uove stated, the amount left for local use would have been 225,160 cwt., a figure considerably in excess of the local consumption estimated from other sources of information, vis, 131,000 cwt. {Note on Cotton by ?*? venue and Agricultural Department}. It may be pointed out in passing however, that the exports representing, as they do, those by rail only are, necessarily, in a country such as Hyderabad, but a small propor tion of the total, and that, in all probability, the exports by road may more than double the above amount. Indeed, in the "Note on Cotton" the total exports are said to average 300,000 cwt. With such imperfect data therefore, any calculation as to the amount consumed per head would be
Races. 193	At present two cotton mills exist in the Dominions, which are stated to consume approximately 37,522 cwt. of cleaned cotton annually. RACES OP COTTON CULTIVATED.—In the northern division of the Niz am's Dominions the description of cotton known as <i>Barsee</i> and <i>Nugget</i> <i>{Oomras</i> } is produced, and, as previously stated (p. 83), finds its way into Bombay entirely by road, and is hence credited in the rail returns of the latter. In the rest of the Dominions the chief staple grown is ^w Westerns ^v (one of the forms of G. Wightianum, <i>Tod.</i>). A considerable portion of 'th produce of the Kunar Idldbad district finds its way to the Hinganghat' market, is greatly valued, and fetches high prices.
Provincial Trade. 194	ANALYSIS OP LAST YEAR'S TRADE.—Rail-borne imports during the yea under consideration were very insignificant. Of the 687 cwt. imported, 67 cwt. came from Bombay, 6 cwt. from Madras, and 4 cwt. from Bombay por The rail-borne exports amounted to 82,529 cwt., of which 38,609 cwt was despatched to Bombay port, and 7.429 cwt.to the seaports of Madra G. 194

Cotton Cultivation in Bengal. (Watt & Murray.) GOSSYPIUM*

for shipment; 30,226 cwt. went to the presidency of Madras, and 6,265 cwt. to Bombay. Besides these registered exports, however, a large amount is exported by road to the Central Provinces, Bombay, Berar, and probably also to Madras. **zo. BENGAL. References.**—/I Selection of Papers showing the measures taken since 1847 to promote Cotton Cultivation in India (Parliamentary), PL I; Hunter, Orissa, II., 45, i34, App. iv. ; Medlicott, Hand-book on Cotton, for Ben-

References.—/I Selection of Papers showing the measures taken since 1847 to promote Cotton Cultivation in India (Parliamentary), PL 1; Hunter, Orissa, II., 45, i34, App. iv. ; Medlicott, Hand-book on Cotton for Bengal (1862); Reports by Director of Land Records and Agriculture ; Rept. by the Gout, of Bengal, 1876, 1878; Correspondence on Cult, of Cotton in the Sanderbands ; Agri-Hort.Soc. of Jnd., Trans., II., in, *32, 'Sp 5 V., SU 52, 167; VI., 106, 2x9* 244; VII., Proc, 17 ; Journals; (Old Series), III., 9, 69, Sel. 291; IV., 92-105, 135, 151-172, 241-248 ; V., 107-205 ; VII., 287-292 / XI., 414-421* 434-440* 49*5*3*534-550 / Proc. xviii., xii, 29-76, 212-264, 273-286, 325-3*9'
REVIEW OF THE AREA, &C.—In the absence of agricultural statistics, the Lower Provinces, it is not known what is the exact area under cotton.

REVIEW OF THE AREA, &C.—In the absence of agricultural statistics, for the Lower Provinces, it is not known what is the exact area under cotton. It is, therefore, necessary to accept as approximations the following statistics for 1876-77, which nave been extracted from a report furnished by the Government of Bengal in 1878 :—" There are, as far as can be ascertained, 162,000 acres under cotton cultivation in Bengal, yielding 138,800 cwt. of cleaned cotton." Accepting the above figure of acreage as correct, and the total outturn as, approximately, 139,000 cwt., the average yield per acre would have been off.

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acre would have been 0,6tb. In the year 1888-89 the net export amounted to 3,562 cwt., which would have left from the accepted average outturn 135,438 cwt. as available for local consumption, or "2lib per head of population. This small figure may either be due to an under-estimate of outturn, or to the fact that the increasing use of foreign twist and cloth is gradually but surely driving locally-grown cotton out of the bazaYs and is thus leaving a greater amount available for export.

DISTRICTS WHERE GROWN.—The largest area under cotton cultivation is in the district of Sarun, in which 31,000 acres were estimated to be under the plant during 1876-77. In the same year the Chktagong Hill Tracts came next in importance with 28,000, then Cuttack with 20,000, Lohardugga with 15,000, Durbhanga with 12,000, Midnapore with 10,000, and Manbhoom with 10,000 acres. But, although Sarun is shown to have had the largest area under cultivation, the outturn was not sufficient even for local requirements. The largest outturn was in the Chittagong Hill Tracts where it amounted to 50,000 cwt.; next in order came Midnapore, with an outturn of 12,800, Cuttack with 12,500, and Julpigori with 10,300 **cwt.**

In the General Administration Report for 1882-83 the following additional particulars are given :—

"The cultivation of cotton is not of very great importance in any of the districts of Bengal, with the exception of the Chittagong and Tipperah Hill Tracts, Cuttack, and Julpigorl. In the plains of Bengal, which are so fertile in other produce, the production of cotton is an inconsiderable industry, and nothing is exported, while much is imported from the North-West Provinces. The cotton grown in Bengal is in fact insufficient for the requirements of the people and has to be supplemented by cotton brought by land or river from the west, and by an increasing importation of English piece-goods.

"Generally speaking, then, it may be said that the production of cotton does not form an important industry of the cultivators in Bengal. It is cultivated, not as an article of commerce but, for the sake of variety and for domestic use, only the agricultural classes preferring strong Area.

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Districts. 197

GOSSYPIUM	Cotton Cultivation in
CULTIVATION In BENGAL. Districts,	home-spun cloth to the less durable machine-made European piece-goods procurable in the bazar. There is no anxiety on the part of the cultiva- tors to extend or improve the cultivation of cotton." (General Administra- tion Report, 1882-83.)
	The last paragraph of the above extract appears to take a rather too gloomy view of cotton culture in Bengal, for both the exports and cultivation appear to have increased during the past few years. In his report for 1886-87 (page 8), the Director of Land Record* and Agriculture writes as follows:—"Cotton was formerly grown exatensively in the Dacca and Mymensingh districts, in a large tract o." land, the soil as well as the physical aspect of which are very well suited to the cultivation of the plai.t. The cotton raised here, $tnou$ £j rather short in staple, was the finest known in the world, and'formea the material out of which the very delicate and extremely beautiful Dacca muslin was manufactured. Since the decline of that celebrated fabric, the cultivation of cotton has almost entirely ceased in this tract. Constdering the high price that cotton fetches in most parts of Bengal and the improvement which has been effected in the yield by the introduction of some of the best American varieties, the cultivation of this im- portant crop may be revived in the locality with great advantage/*
Races. 198	RACES OF COTTON.—Though this province gives its name to the most extensively cultivated of all Indian cottons, "Bengals," it appears probable that much of the locally-grown cotton, most of which is used for home con- sumption, does not belong to G. herbaceum in any of its forms, as defined by the <i>Flora of British India</i> . It is needless in this place to again enter into a consideration of the plants which produce the finer staples of Mymen- singh and Dacca, a full account of which will be found in the descriptions of G. arboreum (pp. 7-13) and G. herbaceum (pp. 25-29). Sufficejt to sajr that, besides the ordinary hybrid forms of the G. herbaceum series, G.
Conf. with p. 24.	 "iieglectum. Tod., almost in its type form appears to be largely cultivated, especially in the eastern parts of the Lower Provinces. Numerous experiments have been made in Bengal, as elsewhere, with the object of introducing exotic seed. For a description of the earlier and more energetically carried out of these, the reader is referred to the article on G. barbadense, also to the exhaustive literature on the subject contained in the publications oi the AgriHorticultural Society of India* above cited, and to Mr. Medlfcott's Cotton Hand-book for Bengal* The following extracts from provincial reports, relating to the attempts made in later years, may, however, be quoted. It will be seen that recent experiments have been chiefly directed towards the introduction of Nankin cotton :—
Conf. with p. 17.	 '' It having been brought to notice that a species of indigenous khaki-coloured cotton is grown in Durbhanga, Chittagong, and Hill Tipperah, it was thought that the cultivation of Nankin cotton would be most likely to succeed in these or in the neighbouring districts. Arrangements have accordingly been made for the experimental cultivation of Nankin cotton in Mozufferpore and Hill Tipperah. It has been found that this cotton can be grown with success in the Government Estate of Kho'ordah in the Orissa Division. '' [Agricultural Report, Bengal, i88\$~86.) At the Burdwan Ráj experimental station ''eight different varieties of cotton were experimented upon. The plots were manured with bone-meal at the rate of I,080ft per acre, with the following results :
	G. 198

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Bengal.

CULTIVATION unlike experiments made in other districts, very good results were obtained with Nankin cotton this year in the Burdwan farm. The plants looked quite healthy, and proved more hardy than any ether varieties experimented upon. They have put forth new shoots and leaves, and a Experiments with exotic forms. second crop is expected. Experiments on the cultivation of Nankin cotton were also tried in Mozufferpore and Hill Tipperah, but without success. Mr. Sen at first tried Nankin cotton as a winter crop, and, as such, it did not germinate; but planted in the beginning of the rainy season, in drills 30 inches apart, and manured with bone-meal, Nankin cotton, as the figures quoted above show, gave very good results. I do not, however, think it will ever be extensively grown in Bengal. " {Agricultural Report, Bengal, 1886-87.)

h appears probable that the anticipation in the last paragraph will prove correct. The growth of Nankin cotton in several districts of Bengal is not unknown. Cotton of the natural khaki colour is grown extensively in some districts of the Patna Division. In 1883 khakicoloured cotton seed was obtained from the Government Experimental Farm at Cawnpore and distributed to the Commissioners of Burdwan, Chittagong, Bhagulpore, Orissa, and Chutia Nagpur for experiment in their respective divisions. The results of the trials reported by them were not very promising. Thus in the report on the trials in Manbhoom it is stated that "Dr. H. W. Hill sowed broadcast the pound of seed received by him. Only a small portion germinated, and the cotton produced was of small quantity and of a brownish red colour. Dr. Hill thinks that the *khaki* cotton is a hybrid between Gossypium herbaceum and G. barbadense.* He says that a species of this plant, if not indigenous, is cultivated to some extent in parts of Patkom and Burrabhoom, chiefly by the Sonthals, who call it *khuruah kapas*, in contradistinction to huraivah kapas, or white cotton. The colour of this khuruah kapas is of a much lighter shade than that of the *khaki* cotton experimented on, and the Sonthals spin and weave it into a sort of coarse cloth. TI 3 species found in the district is considered by Dr, Hill to be a hy jrid of Gossypium herbaceum. "t In the [report from the Commissioner of the Orissa Division, it is stated that the khaki-coloured cotton is liable to hybridise, which, to a great extent, destroys the uniformity of .the colour. In the agricultural report for 1887-88, Nankin is said to have yielded 594ft per acre, Lonacinu, 270ft, Upland 135, and New Orleans 162.

SOILS AND METHOD OF CULTIVATION.—The following information is chiefly extracted from the report on cotton published by the Bengal Government in 1876:-

I. RAJSHAHYE AND KUCH BEHAR DIVISION.—The cotton plant is found within the following four districts of this division—Rajshahve, Bogra, Julpigorf, and Darjeeling, but can be said to be cultivated only within the two last-named districts.

In the Darjeeling district, the cultivation is almost entirely confined to the Terai at the foot of the hills, where the cultivators are the Mechis and Dhimals, who inhabit the jungle tracts near Nuksurbari, Adulpore, 'Kyna-noka, and Champasari, and also the country west of the Teesta and north of the Julpigorf district. Virgin soil, or, at the least, land for the most part with jungle growth, is selected, of sufficient elevation to secure natural drainage. The land is prepared from February to April,

* If he received the form generally known as G. religiosum he was probably not

f It is one of the hybrids of G. neglectum.—Ed.

G. 200

Soils. 200

GOSSYPIUM.

BENGAL.

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(Watt & Murrav.)

135

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 Soils. sionally cotton is sown in the Indian corm and bhadoi ah^{RN} traced, but crops being cleared off in succession before the cotton mas. Future rates this plan is seldom resorted to, as the Mechis do not, as a terrective their own food supply, but purchase it with the proceeds 01 the rates this own food supply, but purchase it with the proceeds 01 the rate of their own food supply, but purchase it with the proceeds 01 the rate of the own food supply. But purchase it with the proceeds 01 the rate of the lubigori district cultivation is similarly carried of the Moschis and Garos, while grow it on high lands near the The lack hills in the Mynagore tabali, and in the Bux sub-division. The lack hills in the mothern parts of the Rajshalve district the ray at a district of scattered cotton plants in their mulberry fields; on an aver g are not more than, say, 50 or 60 plants in a bigha. The former lack the very little that is cultivated being entire? The former lack the very little that is cultivated being entire? The former lack the very little that is cultivated being entire? The former law of the laterite soil where fine qualities of cotton were former ly pur forest, on that laterite soil where fine qualities of cotton were former ly grown in sufficient quantities to make Dacca mushin world "market", and a district Patter of a wearers at Baritore and Polsia, in Attia, and the follower in district. Patters and Polsia, in Attia, and the follower for any sown in March and April, and the crop is gathered in December and sown in March and April, and the crop is gathered in December and sown in March and April, and the crop is sown, the rate is grown for the strate former ly more former ly more in the raties of the fine market and the former ly more and baddy-tended cultiv	GOSSYPIUM.	
a secondary crop, the seed being sown broadcast in fields prepared to other crops. Westerly winds with moderate rains are favourable to va growth; continued easterly winds are injurious and are supposed to favour	CULTIVATION in BENGAL.	during which months the jungle is cut down and burned. this being the sole manure received by the plant. Sowing commences which the standard of the corp being gathered in February and warield a mes- sionally cotton is sown in the Indian corn and bhadoi and warield a mes- sionally cotton is sown in the Indian corn and bhadoi and warield a mes- sionally cotton is sown in the Indian corn and bhadoi and warield a mes- sionally cotton is sown in the Indian corn and bhadoi and warield a mes- sionally cotton is sown in the Indian corn and bhadoi and warield a mess- their own food supply, but purchase it with the proceeds 01, us searcely crops. As the cultivation at best is very rude, a second cr ^{op} met of gins or fallow soils, depending upon nature to make up for their lazi waries and Gatos, who grow it on High lands near the The last in the Hynagore tahsil, and in the Buxa sub-division. The last naturally rich, is cleared of jungle, turned over a little with d the crop is picked in February and March. In the northern parts of the Rajshahye district the rayats de the crop is picked in February and March. In the northern parts of the Rajshahye district the rayats de the crop is picked in February and March. I. DACCA DIVISION.—NO cotton is now grown in this [""All for external trade, the very little that is cultivated being entire" of from for the another the soil where fine qualities of cottom were grown in sufficient quantities to make Dacca musin world "maguage and grown in sufficient quantities to make Dacca musin world" and the sect and grown in sufficient quantities to make Dacca musin world "maguage and grown in March and April, and the crop is gathered in Decemoe January. The variety grown is known locally as bhuta or bhuma I. A small amount of cultivation is also carried on in the kajiny. The sole and turned up with the Filperah hodal or hoe. The sect and grown in March and April, and the crop is gathered in Decemoe January. The variety grown is known locally as bhuta or bhuma I to grown both on lofty hills an
in appearance of the bon-worm.		growing district of Bengal, <i>viz.</i> , Sarun. In this district cotton is $\&^{\sigma n} jj^*$, a secondary crop, the seed being sown broadcast in fields prepared to other crops. Westerly winds with moderate rains are favourable to v_2

Bengal.

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(Watt & Murray.) GOSSYPIUM.

The chief cottons of Sarun are known locally as— I, Bhagtha; 2, Bho- [CULTIVATION] *chri*; 3, *Jathua*; and 4, *Kockti*. The first three forms are called collectively *Bysakhi*, being harvested in *Bysakh* (April), the fourth is called *Bhadoi*, being harvested in *Bhado* (August). The latter is sown in January In BENGAL. *Bhadoi*, being harvested in *Bhado* (August). The latter is sown in January and February, the first three in June and July. It seems probable that the crops reaped in the hot weather are approximately typical forms of G. **neg-lectum**, *Tod.*, the others conditions of the hybrid which yields the com-mercial "*Bengals.*" In Gya three kinds are distinguished, *viz, braisa* or *bung a, rerhia*, and *bhochri*, of which the first is the most valuable, but the second most grown, since it yields a greater outturn. Two forms chiefly are grown in Mozufferpore known as *bhogla* and *bhochri*, the former of which is the better. An exotic called *belati* (possibly Peruvian cotton) is also grown, to some extent, round houses. In Durbhanga very little is grown. The cro^Trecorded is of three kinds, *kockti, bhoera*, and *bhogla*. Of these, the first is very much prized as the cloth prepared from its floss is very lasting. Conf. with pp. 10-12. first is very much prized, as the cloth prepared from its floss is very lasting. It is sown twice a year, first in October to November, second in February and March. The first crop is uncertain, the second seldom fails.

The authors find it impossible to relegate all the forms distinguished by the above vernacular names to their respective species, varieties or hybrids; they have, however, mentioned them in the hope that some or all may be collected and botanically identified.

V. BHAGULPORE DIVISION.—In this division cotton is generally grown either with other crops, or on the boundaries of fields, as a hedge. It is never irrigated. In the Sonthal Pergunnahs it is grown on second class upland soil in company with *serguja* or *til*. The samples from this division seen by us are G. neglectum, Tod.

VI. ORISSA DIVISION -In the Cuitack district two sorts of cotton are grown, locally distinguished as achua and haldia. The former is preferred to the latter, as it contains a greater amount of fibre in proportion to the seeds, and the staple is finer, softer, and more glossy achua is growp c? lower lying ground, a small part of the area being irrigated. *Haldia* is cultivated on higher lands near dwellings. The latter is probably G. aeg-Iectum,7W., the former a condition of G. herbaceum. Small quantities are annually raised in Pufi* and Balasore, but neither of these districts is of sufficient importance to call for description.

VII. CHUTIA NAGPUR DIVISION.—Cotton cultivation is not carried on on an extensive scale in any part of this division. The people generally grow it in small patches in their baree or homestead lands, or in the jungles on variable areas only partially cleared. Many villages and tracts lying on the borders of rivers possess very fine alluvial soil which probably (with irrigation) would yield very fine crops. But the people do not care to grow cotton as a staple of trade, preferring those crops, such as cereals, which give them least trouble.

The principal cotton-growing district of the division is Palamow. In Chutia Nagpur proper, the most important cotton cultivating locality is Biru, where the staple forms one of the main sources of income to the people. In the Sili and Tamar pergunnahs to the south-east of the district, a large quantity of the better class of irrigated cotton is produced.

In Hazaribagh, Singhboom, and Manbhoom the outturn of cotton is small, and is entirely used for home consumption. Specimens seen by the authors from the last-mentioned district belong to G. neglectum, *Tod.* (see p. 8).

SEASONS OF SOWING AND REAPING.—The-information given below of the time when cotton is sown and pickeS is taken from the report by

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Seasons. 201

G. 201

Soils.

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Cotton Cultivation in

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| CULTIVATION<br>in<br>BENGAL.              | the Government of Bengal in November 1878, since later particulars are not available:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                            |                                                                                                        |                                                                                                                                                                                                                  |                                                                                                               |  |  |  |  |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Seasons.<br>Yield.<br>202<br>Cost.<br>203 | DISTRICT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | When sown.                                                                                                                                                                                                                 |                                                                                                        | When picked.                                                                                                                                                                                                     |                                                                                                               |  |  |  |  |
|                                           | Midnapore . •<br>Chittagong Hill Tracts<br>Durbhanga • .<br>Sarun • • •<br>Cuttack • • •<br>Lohardugga • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (May or June.<br>October to Novembe<br>April and May.<br>October.<br>May or June.<br>Une and July,<br>anuary or February<br>une and July.<br>November and Decer<br>October.<br>Tune.<br>May to July.<br>September to Decem | r. Febi<br>Nov<br>Aug<br>Mar<br>Apr<br>, Aug<br>Octo<br>mber. May<br>Apr<br>Octo<br>May<br>Nov<br>Octo | tember to Ma<br>ruary to June<br>ember and Do<br>ust and Septe<br>ch and April.<br>il and May.<br>ust and Septe<br>ober and Novo<br>y and June.<br>il and May.<br>ember to Jan<br>ober to Decen<br>ruary to Apri | e.<br>ecember.<br>ember.<br>ember.<br>ember.<br>uary.<br>nber.                                                |  |  |  |  |
|                                           | <ul> <li>YIELD PER ACRB.—According to agricultural returns the average yield all over the presidency is Gift per acre. The returns for various districts, however, show great differences. Thus, in Mymensingh, the outturn is put as high as 476<sup>o</sup> per acre; in theChittagong Hill Tracts it is said to be 200lb; in Midnapore, 144ft; <sup>m</sup> Manbhoom, 90ft; in Cuttack, 70S); in Lohardugga, 56ft; in Durbhunga, 30ft; and in Sarun, only 20 to 24ft per acre.</li> <li>It is difficult to explain why such great variation in yield should exist in neighbouring districts, in which the method of cultivation and soil do not necessarily greatly differ. At the best, however, the figures are only approximations, and must at present be accepted for want of better.</li> <li>For the yield of various races experimentally grown in the Burdwan Raj Experimental Station in 1886-87, see p. 134.</li> <li>COST AND PROFIT OF CULTIVATION.—In the Bengal Government Report already referred to, the cost of cultivation, and selling price of cleaned cotton per cwt., is given for three districts as follows :—</li> </ul> |                                                                                                                                                                                                                            |                                                                                                        |                                                                                                                                                                                                                  |                                                                                                               |  |  |  |  |
|                                           | DISTR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ист.                                                                                                                                                                                                                       | Outturn<br>per acre.                                                                                   | Cost of cultivation.                                                                                                                                                                                             | Average<br>selling price<br>per cwt.                                                                          |  |  |  |  |
|                                           | Burdwan • •<br>Bancoorah • •<br>Julpigori . •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | · · · · ·                                                                                                                                                                                                                  | ft<br>120<br>125<br>50<br>120                                                                          | R<br>17<br>10<br>6<br>16                                                                                                                                                                                         | R<br>18<br>20<br>25                                                                                           |  |  |  |  |
| Bengal<br>Trade.<br><b>204</b>            | R2, in Bancoorah<br>are the only ones<br>state of matters in<br>ANALYSIS OF T<br>ing Calcutta, amou<br>Calcutta, 66,599 c<br>cwt. from Assam,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Iwan would, accordin<br>about R7-8, and in<br>available, but canno<br>Bengal generally.<br>THE TRADE.—The tota<br>inted to 119,755 cwt,<br>wt. from the North<br>6,541 cwt. from the<br>t. from Berar, 94 cw               | Julpigori<br>ot be accep<br>al imports i<br>of which<br>I-West Pro<br>Panjab, 980                      | Rio-12. T<br>ted as repro-<br>nto the provi<br>19,492 cwt.<br>vinces and<br>5 cwt. from                                                                                                                          | hese figures<br>esenting the<br>ince, exema<br>came trom<br>Ovdh <sub>B</sub> 2i <sub>9</sub> g'<br>the cemra |  |  |  |  |

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| Bengal. |
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#### (Watt & Murray) GOSSYPIUM.

from Madras; 4,029 cwt. were also imported by trans-frontier routes from CULTIVATION Nepal and Sikkim.

The total exports from the province were 123,317 cwt., of which 120,219 cwt. went to Calcutta, 152 cwt. to the North-West Provinces and Oudh, 80 cwt. to Assam, 7 cwt. to the Panjab, I cwt. to the Central Provinces, 7 cwt. to British Burma, and 2,842 cwt. by frontier routes to Nepal and Sikkim.

The above figures have been derived from the rail and river statistics published by the Revenue and Agricultural Department, and from the Bengat statement of Sea-borne Trade and Navigation, and, consequently, do not include road traffic. The exports from Bengal to Calcutta are mostly from Dacca and the other parts of Eastern Bengal. Details of the propor^ons contributed by the principal districts for the past three years are given below :—

| Who                                                                                                                                | ence exp | oorted                 |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1886-87. | 1887-88.                                                                                                              | 1888-89.                                                                                                        |                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Dacca<br>24-Pergunnahs,<br>Chittagong<br>Fiirridpur •<br>Noakhally<br>Rungpur<br>Hoognly<br>Nuddea<br>Muttra<br>Other districts in | Bang     | <.<br>•<br>•<br>•<br>• | •<br>•<br>•<br>•<br>•<br>• | <ul> <li>.</li> <li>.&lt;</li></ul> | •        | 21,583<br>13.723<br>6,659<br><b>5 969</b><br>4^562<br>2,884<br><b>4 307</b><br>i!056<br><i>Nil.</i><br>2,482<br>4,109 | 39,368<br>20,233<br>20,548<br>7,819<br>4.700<br>4,183<br>6,444<br>1.710<br><i>Nil.</i><br>1,661<br><b>1,358</b> | 53,286<br>16,629<br>21,474<br>9,814<br>8,875<br>3,512<br>4,543<br>1,836<br>6,489<br>',995<br>759 |

The above figures to some extent include road returns which have not been embraced by the foregoing statement. From the table it will be se<sup>n</sup> that exports from Bengal to its chief town are gradually increasing, the increase being most marked in the case of Dacca and Chittagong. It is difficult to determine how much of the increase in the case of the former is dependent on re-exports of cotton imported from other provinces, and railed to Calcutta. In the case of Chittagong the increase is probably due to an extension of cultivation and increase of outturn in the Chittagong Hill Tracts.

#### zz. ASSAM.

#### References.—Darrah, Note on Cotton in Assam, 1885; Agri-Horticultural CULTIVATION Society 0/ India, Journals & {Old Series}, IV., 207; VII., 45-50; IX., in 251, 336-342; (New Series), III., Sel. 35.

REVIEW OF THE AREA, &C.—Owing to the absence of an establishment for registering agricultural statistics over the greater part of the province, it is almost impossible to frame an accurate estimate of the area under a particular crop. This difficulty is said by Mr. Darrah, the Director of Land Records and Agriculture in Assam, to be particularly intricate in the jcase of cotton, a crop which is almost unknown in the plains of the Assam Valley where alone the rudiments of a registering system are to be found. In the hill districts, on the other hand, where no such system of any kind exists, the crop is a very important one. The figures given below are, therefore, at the best only fair approximations to the actual state of affairs. The total area under cotton in Assam during the year 1888-89 <sup>w a s</sup> returned as 40,588 acres. The total outturn in the same year was 54,359 <sup>c</sup>wt<sub>></sub> giving the high average yield of 150ft per acre. Deducting the net export from the total outturn the amount available for local consumption is seen to have

Area. 206

205

139

Trade.

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| GOSSYPIUM                      | Cotton Cultivation in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
| CULTIVATION<br>ASSAM.<br>Area. | been 28,593 cwt. This, divided by the population, gives the consumption of<br>home-grown cleaned cotton at o*67ft per head. The Director of Land<br>Records and Agriculture, commenting on this figure, remarks, "At first<br>sight the figures, thus obtained, appear ludicrously wrong. But, though I<br>do not contend that they can be trusted, or even that they possess any<br>value, I would submit that they are not so absurd as thev seem at first<br>sight to be. A very large proportion of the population in Assam wears no<br>indigenous cotton whatever—traders, officials or all ranks, tea planters, es-<br>tablishments, garden coolies, pleaders, priests and their disciples, well-to-do<br>Assamese, and, in fact, all but the very poorest classes, probably nevSr use<br>indigenous cotton at all. Silk is largely worn by all respectable Assamese,<br>and, if cotton cloths are required, they are usually of English make. Indi-<br>genous (Assam grown) cotton is probably in little demand, except ar'ongst<br>the hill tribes who mainly grow it." In the same report the average con-<br>sumption per head in the Giro Hills is stated to be 3* 17ft, in Cachar<br>2*64, while in Nowgong it is returned as only 0*2lib.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |
| Districts.<br>207              | Districts of the province may be learned as only 0°210.<br>Districts of the province may be learned by the following extract from the Monograph on Cotton in Assam, written, in 1885, by the Director of Land Records and Agriculture:—<br>I. Assam Valley.—'' In the plains patches of cotton are met with here and there. The Miris of Lakhimpur and Sibsagar grow a little for their own domestic consumption. In some mauzas of the northern frontier the cultivation of cotton on the lower slopes of the Bhutfn hills, and in the light soil at their foot, used once to be carried on extensively. It was known as gari cultivation, and the Chaqaguri mauza in Kamrup was once famous for it. In the Godlpara district some cotton is grown in the hilly portions of the Sidli and Bijni parganas. In Kamrup <i>jliuming</i> (removing jungle for purposes of cultivation) is carried on for cotton to a limited exten on that portion of the Khasia hills which is included within the district th'^only district in the Assam valley which grows cotton largely is Now grong. The exception is due to the fact that the range of the Mikir hill is included within its boundary. The Mikirs grow cotton, not only fo domestic consumption, but also for export, and boat-loads of it may b seen going down the Kopili and Kollong towards the close of the cole weather."<br>II. Surmą Volley.—"Similarly, in the Surma valley, cotton is only occa sionally cultivated in the plains districts. The Mikirs andTipperas grow some by <i>jhtiming</i> in pergunnah Mulagul in Sylhet. About 50 acres ar supposed to be under cotton in Cachar is high, but that is because the district in Cultivation in the Plains,—" Altogether, however, the cultivation of the Cathar Asism range. Here cotton is largely grown for export as well as for local consumption, by hill Cacharis, Nag-as, an Kukis. The Sadr sub-division grows but little cotton."<br>III. Cultivation in the Plains,—" Altogether, however, the cultivation of cotton in the plains districts of Assam is, with the exception of that i Nowgong and the North Cachar Hi |  |  |  |  |  |  |

climate is too cold. The Giros grow it in very large quantities. The CULTIVATION inhabitants of the Khasia and Jaintia Hills carry down hundreds of maunds every year to Kámrup and Nowgong. The Ndgás (Lhotas and Rengmas) export partly to Nowgong, but principally to Sibsagar."

As already stated the figures of outturn and area in the hill districts of Assam are based on calculations which are open to grave error. They have been arrived at as follows:-"The usual system has been to ascertain, by enquiries at the various submontane fairs, the quantity that has been exported in a given year. An addition is made for the amount taken out of the country by traders who do not visit the fairs, and also for the amount believed to be locally consumed. The result gives the probable quantity produced. This is divided by the assumed outturn per acre, and an estimate of the area is thus found."

BV calculations carried out on this plan in the case of the hill districts, and by the imperfect system of registration in the case of the plains, the following figures have been arrived at for the year I888-89 :--

| DISTRICT.                                                                                                                         |                   |   |   |   |   |     |  |                 | Area under<br>Cotton.                                                                                        | Total outturn<br>of cleaned<br>Cotton.                                                                                    |  |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------|---|---|---|---|-----|--|-----------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--|
| Sylhet<br>Cachar<br>Goálpára<br>Kámrup<br>Darrang<br>Nowgong<br>Sibsagar<br>Lakhimpur<br>Khásia Hills<br>Giro Hills<br>Nágá Hills | • • • • • • • • • | • | • | • | • | тот |  | • • • • • • • • | Acres.<br>2,714<br>8,956<br>1,445<br>1,059<br>2,089<br>34<br>5<br>3,324<br>20,866<br>Not reported.<br>40,588 | Cwt.<br>3»634<br>12,794<br>3,380<br>472<br>123<br>9 <b>26</b><br>3,086<br><u>33,534</u><br><u>Not reporibd.</u><br>58,011 |  |

RACES OF CoTTON.—Mr. Darrah, in the report above quoted, writes as follows :---'' The varieties of cotton are not numerous, but the names by which the crop is known differ from district to district, and peculiarities of soil, climate, and method of cultivation, have no doubt produced divergences from the original type. It is not easy, therefore, to say exactly how many really different kinds there are. Roughly speaking, there are two well-marked forms :---

"(1) The large-boiled high growing cotton, known as dhal (white flowers) in Lakhimpur, as bogakapdh in the Majuli, as khungi deva in Cachar, as kil in the Garo hills, and as borkapdh (lit. % large cotton) in Nowgong. This is probably also the same as the bhugai of Sylhet. In Nowgong, this species is grown on level ground, has a smaller number of seeds than the second variety (mentioned below), can be ginned more easily, can be plucked twice a year instead of once, and bears for three seasons. The kil of the Garo hills is very nearly the same, except that the crop is annual, that it is grown everywhere on the hill-sides, and not confined to level ground, and that it can only be plucked once a year. The pods are very large, sometimes as much as eight inches in length, and when they burst the contents come out in a cataract of cotton which gives a field the appearance of being covered with snow. This variety is, however, not as much in request for ordinary purposes as the smaller kind. The fibre is Races. 208

in ASSAM. Districts.

| GOSSYPIUM                                              | 1. Cotton Cultivation in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CULTIVATION<br>in<br>ASSAM.<br>Races.<br>Soils.<br>209 | said by the trade to be harsh and to twist badly. It is better adapted for mixing with wool than for any other purpose.<br>"(2) The small, round-boiled species, known as <i>shet</i> (reddish flowers) in Lakhimpur, as <i>thumsa</i> in Cachar, as <i>ukynphdd</i> in the Jaintia hills, and as <i>horu kapdh</i> ( <i>ii.</i> , small cotton) in Nowgong possibly identical also with the chotsd of the Angdmi Nagas. This species is sown annually, and can only be plucked once a year. The Lakhimpur variety has pale reddish flowers. That grown in the Jaintia hills is said to be the best cotton produced in the province. Its thread can be more closely woven than that of other kinds. The N£ga hills variety is rated lowest of all, being very short in the staple and coming into the market in a very dirty condition, " There is a pale <i>khaki</i> variety in Cachar and Manipur known as <i>khungdjas</i> in the former and as <i>tissing anguangba</i> in the latter district, The pods are not a uniform <i>khaki</i> , but contain a few white threads here and there." It is difficult to determine to what species all the above mentioned kinde belong. The large boiled, high grown cotton, however, is in most cases probably G. neglectum, <i>Tod</i> .; in the case of the Garo hill cotton it certainly is so. Specimens which have been seen by the authors are perfect types of that species, and have the very large ovoid bolls referred to by Mr. Darrah. The statement that the cotton of Lakhimpur ( <i>dhdl</i> ) has white flowers is curious, and would suggest its being a form of G. neglectum <i>var</i> . Otusifolium; the small cottons of Cachar, and Nowgong are probably also forms of G. herbaceum or G. Wightianum, <i>Tod</i> .*" Weile the <i>shet</i> of Lakhimpur would appear, from its reddish flowers, to be: small round-boiled form of G. arborum or G. Augent, the anture or soil, methods of cultivation, cleaning, &c., to Mr. Darrah the difficulty is greater. The <i>chotsd</i> of the Angámi Nágas is undoubtedly G. herbaceum for a distribution of G. arborum or G. Wightianum, <i>Tod</i> .*" Weile the <i>shet</i> of Lakhimpur would appear, from its |
| Methods.<br>210                                        | when they can. The soil should be calcareous, and the situation sunny. I<br>the Garo hills a species of small bamboo grows with great luxuriance, an<br>the soil on which it is found is invariably selected, if the other condition<br>for cultivation are favourable. No manure is ever used, except the ashe<br>of the burnt jungle. One reason why the bamboo is so appreciated by the<br>Garos is that it burns with much more completeness than tree jungle <sup>^</sup> an<br>therefore affords better manure."<br>METHOD OF CULTIVATION.—HOEING.—"Land is never ploughed for<br>cotton, except in the few places where it is grown in the plains. In they<br>the ground is ploughed three or four times, and then hoed once, the latter<br>process being considered indispensable in Mangaldai. A trench for drain<br>age is usually dug round the plot. The hill-men always use the hoe, as the<br>slopes on which cotton is grown are too steep for cattle to be employee<br>Moreover, between the stumps of trees and the half-burned logs whic<br>G. 210                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| • · · · · · · · · · · · · · · · · · · ·                                                                                                                         |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Assam, (Watt & Murray.) GC                                                                                                                                      | <u> </u>    |
| often litter the ground, a plough could not be worked. The Nagas generally                                                                                      | CULTIVATION |
| give two hoeings, the Tipperahs and Garos none at all. The other tribes                                                                                         | ASSAM.      |
| generally hoe once. The jungle is usually cut in the cold weather and al-<br>lowed to dry on the ground. It is burnt in March or April, and then, as a          | Methods*    |
| rule, hoed. As soon as possible afterwards the cotton is sown. It is scattered                                                                                  | }           |
| broadcast generally, not put down in drills. The Tipperahs and Garos                                                                                            |             |
| have a different custom. After the burning is finished, they go over the land with a pointed stick, and making small holes in the ashes drop a seed             |             |
| into each. In Cachar a similar process is employed, the seed being dibbled                                                                                      |             |
| in with a pointed stick called <i>kuar</i> . In the first year only one kind of                                                                                 |             |
| seed is placed in each hole. The soil is not further disturbed. It is ferti-                                                                                    |             |
| lised by the ashes on the first shower of rain. If the rain is delayed, the valiy? of the ashes, as a fertiliser, diminishes considerably."                     |             |
| ASSOCIATED CROPS.—" The associated crops are usually broadcast rice                                                                                             | Associated  |
| and <i>til</i> . But some forms, <i>e.g.</i> , <i>thumsd</i> of Cachar, are always sown                                                                         | Crops.      |
| alone. The other varieties are also sometimes sown alone; but, as a general                                                                                     | 211         |
| rule, other crops are mixed with cotton,—mustard, Indian-corn, chillies, brinjals, linseed, jute, water-melons, are all used according to the wishes or         | •           |
| convenience of the cultivator. But <i>dhu dhdn</i> (unirrigated, broadcast rice)                                                                                |             |
| is the most commonly associated crop. In the Giro hills, the usual practice                                                                                     | 1           |
| is for <i>dhu dhdn</i> to be sown broadcast the day after the fire. When the shoots show themselves above ground, the vacant spaces become apparent,            | •           |
| and these are sown with cotton in the manner already described. The                                                                                             |             |
| Rengma Nagas sow the cotton broadcast, with <i>dhu dhdn</i> , the cotton seeds                                                                                  | l'          |
| and the <i>dhdn</i> being mixed up in the same basket. The reason for asso-                                                                                     |             |
| ciating a second crop with cotton is said to be that the latter always grows best if shaded in the beginning."                                                  | 1           |
| OCCUPANCY.—"A jungle-clearing is rarely cropped for more than one                                                                                               | Occupancy.  |
| season with cotton. In the second year upland rice is often sown alone,                                                                                         | 212         |
| and when the crop has been gathered the <i>jhum</i> is usually abandoned. If                                                                                    |             |
| there is suitable land available in reasonable quantities, the clearing !s not<br>resumed for ten years. In no case is it re-occupied until at least five years | ļ '         |
| have elapsed. No rotation of crops is ever observed. In Cachar in the                                                                                           |             |
| second year the paddy straw of the previous year is burnt off, and the                                                                                          | l.          |
| land having been cleaned and turned over with the <i>kuar</i> , rice and <b>seea</b> -<br>mum mixed are sown broadcast. A few days later Indian-corn and cotton | -           |
| mixed with earth are sown, and the ground is kept weeded till August.                                                                                           |             |
| The Indian-corn ripens in July, the rice in August, the sesamum in Nov-                                                                                         | 1           |
| ember, but the cotton not till December. A similar course is followed in                                                                                        |             |
| the third year, and in the fourth the land is abandoned. The Angami                                                                                             |             |
| Nagas, however, frequently crop a clearing with cotton for two or three years, according to the richness of the soil. The variety of <i>dhu dhdn</i>            |             |
| known as <i>tidi</i> is generally sown by them the first year, while in the second                                                                              |             |
| year the kind called <i>teke</i> is usually planted. The Rengma and Lhota                                                                                       | 1           |
| Nagas, who are the principal cultivators of cotton in the Naga hills, never crop a clearing with cotton for two successive years."                              |             |
| IRRIGATION AND WEEDING.—" Irrigation is hardly ever practised,                                                                                                  | Irrigation. |
| ^though occasionally required. The land is usually weeded once or twice,                                                                                        | 213         |

Plucking. 214

<sup>^</sup>Though occasionally required. The land is usually weeded once or twice, rarely oftener. When the crop germinates, sacrifices of eggs are offered by the Mikirs to the god Longlo Ahi. Similar ceremonies take place when the plucking begins."
 PLUCKING.—" Plucking generally begins about November. It is usually over in January. *Kunghideva* is plucked from time to time as the pods open and burst. With *thumsa* the plucking is usually made once for all. The *borkapdh* of Nowgong is plucked twice—once in December and January, when the crop is called *bataria kapdh*, and once in May, when the land is usually made once for all.

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**GOSSYPIUM.** 

Cotton Cultivation in

| CULTIVATION<br>in<br>ASSAM. | for about a month and allowed to elapse betwee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | a half, and<br>n each pickin                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | six days is                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diseases.<br>215            | for long after it is put in germinate. On the othe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | to the groun<br>r hand, heavy                                                                                                                                                                                                                                                                                                                                                                                       | n suffers considerably if ra<br>d, as much of the seed do<br>y rain, when the plant is<br>formed injures the co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | bes not then well grown,                                                                                                                                                                                                                                                                                                                                                                                            |
| Yield.<br>216               | Cloudy and damp weath<br>ning, and for this reason<br><b>also do a good dě</b> : alofin<br><b>chilapok of Lakhi</b> mpur,<br><b>the</b> mitchy of the N&ga<br>Jaintia and Nága hills.<br>these pests are, of which<br>YIELD PER ACRE.<br>cleaned cot ion per ac<br>nature of the crop, the<br>and it is impossible to<br>Several experiments ha<br>Jaintia hills, on plots of<br>outturn of 8ofb of clean<br>average being 171ft.<br>acre. In Nowgong exp<br>one bigha <sub>f</sub> gave an ave<br>Sibsagar the estimate in<br>cotton, or about 150ft<br>experiments in the Gár<br>uncleaned cotton to the<br>cleaned cotton to the m<br>the former to the acro-<br><b>v</b> <eahes figur<br="" high="" the="">150ft of cleaned cotton<br/>estimate."</eahes> | ner is always<br>in the sunniest<br>injury. Whole-<br>the <i>phalo jh</i><br>tribes. Whit<br>"Mr. Darrah<br>h he gives the<br>—Mr, Darrah<br>re is a very<br>experiment m<br>have the fiel<br>ve, however,<br>of a quarter of<br>the Cachar esperiments made<br>erage of 150ft<br>is 128ft; in C<br>to 180ft of cl<br>o hills, made<br>acre. At the<br>aund of uncle<br>e. Even at<br>re of 202ft.<br>to the acre m | e formed, injures the co<br>injurious, except at the<br>spots are invariably chost<br><b>crops are some</b> times dest<br>inght of the Nowgong<br>te ants often cause seriou<br>in unfortunately does not<br>vernacular names.<br>In writes, "The average<br>difficult question to solv<br>ust extend over a consided<br>d under trial watched ni<br>been made. Twelve of<br>of an acre each, yielded<br>he acre, and a maximum<br>stimate is 160ft of cleaned<br>to f cleaned cotton to the<br>Godlpara, 378ft to 450ft of<br>eaned. The latest and<br>upon four acres of land,<br>he Garo hills proportion<br>eaned, this would give no<br>16 seers to the maund,<br>Accordingly, for the what<br>ay be assumed to be a far | very begin-<br>en. Insects<br><b>royed by the</b><br><b>Mikirs, and</b><br><b>s loss in the</b><br>t state,, what<br>produce of<br>e. From the<br>derable time,<br>ght and day.<br>these in the<br>a minimum<br>of 304ft, the<br>ed cotton per<br>e on areas of<br>he acre. In<br>of uncleaned<br>most careful<br>gave 507ft of<br>of 20 seers<br>early 260ft of<br>the produce<br>nole province,<br>airly accurate |
|                             | DISTRICT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Average out-<br>turn in ft.                                                                                                                                                                                                                                                                                                                                                                                         | DISTRICT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Average out-<br>turn in ft.                                                                                                                                                                                                                                                                                                                                                                                         |
|                             | Sylhet<br>Cachar<br>Goilpára<br>Kamrup<br>Darrang<br>Nowgong                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 150<br>160<br>262<br>So<br>150<br>50                                                                                                                                                                                                                                                                                                                                                                                | Sibsagar<br>Lakhimpur<br>Khisia Hills<br>Giro Hills<br>Nága Hills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>150</b><br>150<br>104<br>180<br>Not reported.                                                                                                                                                                                                                                                                                                                                                                    |
|                             | writes:—*' In workin<br>shew uncleaned cottor<br>tion that five maunds<br>a-matter of fact, this e<br>the ordinary native of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | g this out, t<br>n, have been co<br>of the former<br>stimate is rath<br>cotton gin, rep                                                                                                                                                                                                                                                                                                                             | aned to uncleaned cottor<br>he original figures, wh<br>onverted into cleaned or<br>will yield two maunds of<br>er under, than over, the<br>eated experiments have                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ich of course<br>the assump-<br>the latter. As<br>mark. Using<br>given the out-                                                                                                                                                                                                                                                                                                                                     |

the ordinary native cotton gin, repeated experiments have given the out-turn as 17,174, and 18 seers to the maund, whereas the proportion assumed above is only 16 seers to the maund. The Deputy Commissioner of the Garo hills, experimenting with an English ginning machine, gives 20 seers to the maund as the correct proportion. On the other hand, experiments

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | • Assam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | (Watt & Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GOSSYPIUM                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| outturn of but 16 seers<br>a proportion of 2 to 5<br>be remarked in passi<br>portion of 3 to 10 is a<br>cotton from uncleaned,<br>greater, and since that<br>Assam, Mr. Darrah's<br>mark. If this be the ca<br>of cotton, for not only i<br>quantity of uncleaned                                                                                                                                                                                                                                                                                                                                                                                                                                      | e view of making the ex<br>to the maund. It may,<br>is certainly not in exc<br>ng, that for most othe<br>ccepted as the maximu<br>in the case of G. arbon<br>species produces a gr<br>estimate may possibly<br>ase, Assam is particular<br>is the proportion of fibric<br>cotton larger than in<br>cre is also much greater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | therefore, be assumed<br>ess of the fact." It<br>er parts of India a<br>m. The yield of clear<br>reum, however, is prob<br>reat part of the cotto<br>be, as he says, not ove<br>ly suitable to the cultiva-<br>re obtainable from a g<br>most other regions, bu                                                                                                                                                                                                                                                                                                                                                                                                                                    | that in<br>may ASSAM.<br>pro-<br>aned<br>bably<br>n of<br>r the<br>ation<br>given                                                                                                                                     |
| , CLEANING.—The<br>by **. Darrah:—"The<br>'.c, separating the fibr<br>an instrument called <i>ne</i><br>is exactly the same in<br>ot two horizontal roller<br>mounted on an uprig<br>screw, which catches<br>in opposite directions v<br>times the ends of both<br>passes through being of<br>get through the narrow<br>of the teeth of the <i>B</i><br>fore it is passed through<br>this machine gives a<br>cleaned cotton per die<br>being ginned, or the o<br>utilised as cattle-food<br>regular article of sale.<br>hills is IO annas a man<br>away as useless. If if<br>that less uncleaned c<br>partly owing to the s<br>the small value attach<br>comparatively cheap<br>cotton is exported chi | process employed in clea<br>he first step in the process<br>e from the seed. This i<br><i>cothani</i> in Upper, and <i>n</i><br>principle as the <i>charki</i> o<br>s, one close above the ot<br>ht stand. One end of<br>a projection in the other<br>when the handle at the o<br>h rollers are alike and<br>caught by the rollers, bu<br>v slit, are left behind.<br><i>horali</i> fish, is used to p<br>pugh the <i>neothani</i> . Ex<br>result of from one seer<br>m. The cotton must be<br>utturn will not be good.<br>In the parts of Kar<br>Its price in the neighbound. But (Vis> is not ji<br>it were of more value i<br>otton and more cleaner<br>scarcity and dearness of<br>hed to the seed, together<br>in Calcutta and the see<br>efly in the uncleaned stat<br>aned, the cotton is subjective. | ning cotton is thus desc.<br>s of manufacture is clea<br>s usually done in Assa<br><i>eotha</i> in Lower, Assam<br>f Upper India, and co<br>her, generally both of y<br>one roller is formed is<br>r and causes both to re-<br>other end is turned. S<br>screw-shaped. The co<br>at the seeds, being unal<br>Sometimes a comb, for<br>artially clean the cotton<br>periments have shown<br>to two and a half see<br>dried well in the sun H<br>In some places the se-<br>nutp near Gauhati it<br>purhood of Tura in the<br>jencra.1. It is usually<br>n this country, it is pro-<br>d would be exported.<br>I abour here, partly ow<br>with the fact that lab<br>ed there largely in den<br>the.'' | ning,<br>m by<br>a. It<br>nsists<br>vood,<br>nto a<br>volve<br>ome-<br>otton<br>ble to<br>ormed<br>n be-<br>that<br>ers of<br>before<br>eed is<br>is 2<br>04,.<br>flung<br>bbable<br>But<br>ing to<br>our is<br>mand, |

"After being cleaned, the cotton is subjected to a process of beating (*dhuna*) by means of a bow-string, in order that the fibres may separate and become loose enough to be spun into thread. The bow (*dhanu*) is usually a piece of bamboo, about three feet long; the string *{jar*} consisting of a twisted strip of the outside of the midrib of a plantain leaf. The bow is usually held so that the string may touch the cotton. The string is pulled and let go, and the vibration separates the fibres. The principle is precisely the same as that used in most parts of India."

is precisely the same as that used in most parts of India." "There is no special caste in the province, like the *Dhunta* of the Worth-Western Provinces and the *Pinja* of the Panjab, whose occupation it is to pifepare cotton for spinning in the manner described. Each household scutches, if the process may be so called, as much cotton as it requires for its own purposes."

Nearly all the cotton exported from Assam is uncleaned, probably owing to two reasons :—(1) that local labour is too dear; (2) that the seed is of much more value in Calcutta than it is in Assam. In any case the fact is certain that cleaning cotton for export with the native hand-gin does not pay. With the European machine gin, however, the case is differ-

| GOSSYPIUN                                | A. Cotton Cultivation in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CULTIVATION<br>in<br>ASSAM.<br>Gleaning. | ent. Mr. Darrah states that in 1885-86 there were two working European gins in the province—one at Tura in the Garo hills, the other at Doboka in Nowgong, each admirably placed for working the cotton of the Garo and Mikir hills, respectively. The machines have been found capable of turning out one maund of cleaned cotton a day, each realising a daily profit of $\mathbf{R5}$ -                                                                                                                                                                             |
| Packing                                  | Reports from Calcutta, however, tend to shew that, though the Emery<br>gin may be worked profitably, the fibre is considerably diminished in value<br>by its action. Thus, in one case a bale of hand-ginned cotton was found<br>to be worth R21 per maund, while the same fibre, saw-ginned, was valued<br>at only R16.                                                                                                                                                                                                                                               |
| Packing.<br>218                          | PACKING.—Assam cotton is not, as a rule, made up into the heavy half-<br>compressed bales commonly met with in other parts of India, but is pack-<br>ed either in conical baskets or in small bales for transportation by^coolies.<br>The former are packed as follows:—" The basket having been lined with<br>leaves of the <i>tar a</i> plant is placed upright in a hole in the ground. One man<br>fills it with cotton, while another treads down the fibre. When filled, some<br>leaves of the <i>targ</i> are placed on the top, and the whole firmly bound down |
| Trade.<br>219                            | leaves of the <i>tara</i> are placed on the top, and the whole firmly bound down<br>with strips of bark or cane. A basket thus packed is called <i>dang</i> , by the<br>Mikirs, and usually weighs half a maund." In the plains instead of these,<br><i>dangs</i> the small bales above alluded to are generally made. They are sus-<br>pended to the ends of a stout bamboo which is borne on the shoulder.<br>ANALYSIS OF THE TRADE.—I. INTER-DISTRICT TRADE.—"The trade in<br>cottop is partly inter district and partly provincial. The registration of the        |
|                                          | cotton is partly inter-district and partly provincial. The registration of the former is carried on at a few police-stations, but no attempts nave as yet been made to summarise or elucidate the figures. The registration is really too partial to throw much light on the character of the trade. It is known, however, that the plains districts purchase largely for local consumption at the marts at the foot of the hills. The Garo hills supply God)para and parts of                                                                                         |
|                                          | Sylhet. The Jaintia and Lower Khasia hills meet the wants of South Kdm-<br>st.rup and North Sylhet. Jaintia Hills cotton also goes down to Nowgong and<br>parts of Sylhet. Darrang is supplied, like the greater part of Nowgong<br>itself, by the Mikirs. North Cachar cotton goes into Nowgong by the<br>Doyang and Kopili, and also into the plains of Cachar. The Naga hills<br>export to Sibsagar and parts of Lakhimpur. In all these transactions-                                                                                                              |
|                                          | human beings are the beasts of burden, except when boats are used. Pack-<br>bullocks are unknown, and ponies are not used for the purpose. The hill-<br>men carry down the fibre, nearly always uncleaned, in conical bamboo<br>baskets, which they support by a plaited cane strap across the forehead,<br>partly on their heads and partly on their shoulders." "The plains people                                                                                                                                                                                   |
|                                          | carry cotton in small bales suspended to the ends of a stout bamboo<br>which is borne on the shoulder. Boats are used when the trade route<br>coincides with a river, and considerable quantities are floated down to<br>the more important riverine marts. Wheeled carriage is absolutely un-<br>known, and long strings of camels, laden with heavy, half-compressed<br>bales, such as are so Frequently met with in the cotton districts of Upper                                                                                                                   |
|                                          | India, are never seen in Assam."<br>II. EXTERNAL TRADE.—"The export trade by boat is registered at<br>Dhubri for the Brahmaputra, and at Bhairab Bazar for the Surma vqiley.<br>The steamer traffic, which is inconsiderable, is known from the returns fur-<br>nished by the steamer companies."<br>In the year under consideration the total exports amounted to 20,4 <sup>^</sup>                                                                                                                                                                                   |
|                                          | cwt• of which 21,964 cwt. went to Bengal, and 7,471 cwt. direct to "Cal-<br>cutta, The imports were unimportant, amounting to only 3,671 cwt., of<br>which 49 cwt. came from Calcutta, 89 cwt. from Bengal, and 3,533 cwt.<br>by trans-frontier routes from Bhutan, Hill Tipperah, and the 'L,usnaï "Hills.<br>G. 219                                                                                                                                                                                                                                                  |

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#### Myaore & Coorg.

# (Watt & Murray.)

## 12. MYSORE.

**Reference.**—*Gazetteer*, *I.*, *26*, *S7IU*; \*>'. \*#» *347*, *456*.

REVIEW OP AREA, &c.-The average area, for the five years ending 1886-87 was 29,814 acres; and the outturn during the same period 11,459 cwt.; the average yield would.*too*, have  $taff| \ll IPJ \land e^{-c}$ . The total outturn is insufficient for local  $\land h \ll H$  and  $J \land J \land L \land \land$  by rail, the latter to I,120 cwt.; considerably greater quantities, however,

are probably imported by road. n/u,ertrp arp nmba-

RACES OF CoxTON.-The ordinary native cottons of M y w « p r oatrad bly similar to those of Madras, «\*., forms of G. W «  $^{\circ}$  « \*\*  $^{\circ}$  t on s of G. herbaccum, J, obtusifolium, and G.  $MZ^{I**TM}$ .  $^{U^{\circ}}$ ?TM $^{0^{\circ}}$ 

Numerous experiments have been made at Bangalore to test: the suitability of the soil and climate of that district for exotic cottons, with the result that Upland Georgian, Sea Island, New Orleans, and Egyptian were all found to do well. None of these have gained, however, any hold on the cultivation of the State, \* Ј гтмгм

SOILS AND METHOD OF CULTIVATION.—The following IS extract^ Irom the Gazetteer of Mysore and Coorg, Vol. /..-"The soil on which cotton is sown at Sira is a black clay containing nodules of limestone, in me two months following the vernal equinox, plough three times: At any convenient time, ia the next two months, mix the seed with dung, ana drop it in the furrows after the plough, forming lines about nine inches apart. A month afterwards plough again between the lines1; and in oraer to destroy the superfluous plants and weeds, use the hot drawn by oxen three times, crossing these furrows at right angles. The second and third times that this hoe is used it must follow the same track as at first; otherwise too many of the plants would be destroyed. Between each hoeing three or four days should intervene. In six months the coffice begins to produce ripe capsules, and continues in crop four more. Tn plants are then cut close to the ground, and after the next rainy season the field is ploughed twice in contrary directions. A month afterwards it is hoed once or twice with the same implement, and it produces a crop twice as great as it did the first year. In the third year a crop of *same* or *navane* (Panicum frumentaceum and Setaria italica) must be taken, and in the fourth year cotton is again sown as at first. The principal crop in the fine country towards Narsipur and Talkad is cotton, which iL this locality is never raised in soil that contains calcareous nodules. The black soil that is free from lime is divided into three qualities. The first gives annually two crops, one *oijola* " (Sorghum vulgare, a name also used for Zea Mays) «' and one of cotton ; the two inferior qualities produce cotton only. Cotton is raised towards Harihar entirely on black soil, and is either sown as a crop by itself, or drilled in the rows of a *navane* field. In the former case two crops of cotton cannot follow each other, but one crop *oiiola* at least must intervene. In the second month after the vernal equinox, the field is ploughed once, then manured, then hoed with the *heg kunte*, until the sowing season in the month preceding the autumnal equinox. 1 he seed is sown by a drill having only two bills, behind each of which is fixed a sharp-pointed bamboo, through which a man drops the seed; so that each drill requires the attendance of three men and two oxen. The seed, in order to allow it to run through the bamboo, is first dipt in cow-dung and water, and then mixed with some earth. Twenty days after sowing, and also on the thirty-fifth and fiftieth days, the field is hoed with the edde kunte. The crop season is during the month before and that after the vernal equinox.

**CLEANING.**—The floss is cleaned by means of a rude native gin or *charka* G. 224 10 A

224

Soils. 223

Cleaning\*

GOSSYPIUM.

CIULTIVATIOM

MYSORE.

220

Area.

221

Races.

222

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|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GOSSYPIUM.               | Cotton Cultivation in"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CULTIVATION              | similar to that described elsewhere. After ginning, it is soutched by means                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MYSORE.                  | of a bow, this operation being the special occupation of a class of Musal-<br>mans called <i>Pinjari</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Trade.<br>225            | ANALYSIS OF THE TRADE.—The railway-borne trade in cotton is very insignificant, and probably represents, but very imperfectly, the total traffic, most of which must be by road. In the year under consideration (1888-89) the exports by rail amounted to 1,120 cwt., of which 1,024 cwt. went to Madras seaports, 60 cwt. to the presidency, 35 cwt. to Bombay, and 1 cwt. to Bengal. The imports were larger, amounting to 3,159 cwt., of which 3,043 cwt. came from Madras, 104. cwt. from the sea-ports of that presidency, 9 cwt. from Bombay, and 3 cwt. from Bombay town.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                          | 13. <b>BURMA.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| CULTIVATION<br>in BURMA. | References.—Kurg, For. Fl. Burnt., I., 129; Mason, Burma.and Its<br>People, 518, 756; Reports by Rev. & Agru Dept. on Cult, of Cotton in<br>British Burma; Rept. by^Depy. Commr <sub>%</sub> Meiktila, Dec. 1888; Rept. by<br>Burnt. Govt., 1888; Agri-Hort. Soc. Ind. Transactions.—//., 124; V<br>205; VI., 13*; Journals, VII. <sub>9</sub> 45-50; IX., 153; XI., JO7-3J5, 5^4'S^S<br>XIV., 111-U2; {New Series}, I., Proc. xxxiv.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| LOWER<br>BURMA.<br>226   | <b>I. LOWER BURMA</b> —It is necessary in this article to consider Lower and Upper Burma separately, since no accurate statistics are available for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Area.                    | area, outturn, or trade in the case of the latter.<br>REVIEW OF AREA, &c—Cotton cultivation has greatly fallen off in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 227                      | Lower Burma, notwithstanding the fact that the more inland districts<br>possess soil and climate apparently well suited to the plant. In fact, in<br>former times, cotton was largely cultivated in these districts. A consider-<br>able quantity was at one time exported from the Tharawaddy and Prome<br>districts by Arakan to Dacca, where it was used in the manufacture of the<br><b>fine muslins of that place.</b> In the Journal of the Agri-Horticultural<br>Society of India, Vol. XL, 584, it is stated that, " The species of cotton is still                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                          | <sup>^</sup> Jthe green seed variety and requiring from seven to nine months from the<br>sowing of the seed until the crop arrives at maturity. The staple is of a<br>peculiarly soft and rich appearance, and even now nearly the whole pro-<br>duce is exported to Tinian for the Chinese market." Now-a-days, however,<br>the crop is an extremely unimportant one, and the produce is used almost<br>exclusively for home consumption. During the five years ending 1885-86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Methods.<br>228          | the average area under the crop was 11,500 acres, while in 1888-89 it was<br>only 10,191 acres. The total outturn is said to have been 9,494 cwt. The<br>total imports were 55,295 cwt., the total exports 48,897 cwt, leaving a net<br>import of 6,398 cwt. This, when added to the outturn, gives a total of<br>15,892 cwt. as available for local consumption. Dividing this amount by<br>the population, 3,736,771, we obtain '47© per head of population as the<br>average annual consumption. This figure, however, is probably an un<br>der-estimate, since it appears likely that considerably more cotton may be<br>imported from Upper Burma than is shewn by the trade returns.<br>METHODS OF CULTIVATION.—Cotton is not grown to any extent as<br>field crop except in parts of the Sandoway and Amherst districts; else<br>where, as in the hilly tracts of Thayetmyo and Northern Arakan, it i<br>almost invariably grown mixed with other crops. Referring to the diminution in area, the Chief Commissioner in 1882-83 wrote as follows:—<br><sup>11</sup> The shrinkage of the area is most conspicuous in the Thayetmy |
|                          | district and appears to be due, in some measure at least, to the prefe<br>ence which the Burmese cultivator has for other crops, requiring less la<br>bour and trouble to produce, and to the cheapness of imported twist, which<br>in some parts of the country, is forcing the home produce out of the marker<br>altogether. In Kyaukpyu, for instance, no cotton whatever is now grown<br><b>G. 228</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| ,    | Burma. | {Watt & Murray.) GOSSYPIUM. |
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and in Arakan generally the home product is rarely brought to market or even disposed of locally in a cleaned state." Further particulars regarding cotton in Burma are given in the sub-

Further particulars regarding cotton in Burma are given in the subjoined extract from the *Lower Burma Gazetteer* published in 1880 {Vol. *L.*, 427):-

"Cótton is grown principally in hill-gardens, and in Thayet. In former years the Thayet produce was carried up-country and exported to Yunan, but the outbreak of the Panthay rebellion checked, if it did not altogether stop, trade by this route, and the price of rice in the husk rose so rapidly anid has continued so high, and the importation of cotton goods and of twist has been so large that there was little or no demand for the homegrown article, and the cultivation of rice has become far more profitable, ifor many years persevering efforts have teen made to introduce foreign cotton, especially Egyptian, Upland, Brazilian, and Carolina, which would give a longer staple, but these have been unsuccessful, not only for the reasons given above—of which undoubtedly the greater returns from rice, together with the large areas of rice land available on the easy terms on which land is granted are the most important—but also because the native plant is hardier and requires little care.

"The cotton grown in Upper Burma is still shorter-stapled than that grown here, and much of that imported uncleaned is taken to Prome, Allan-myo, and Kwa-toung, where are the principal cotton-ginning mills, and cleaned and mixed with Thayet and Prome cotton for export. The plants in British Burma are of two kinds—known to Burmans as the \* large ' and the 'early,' respectively, 'The early kind is a plant which does not grow more than three or four feet high and its bolls are ripe in December and January. The large kind reaches a height of from six to ten feet and its seed does not ripen till a month or two later. The produce of the two kinds is hardly distinguishable.' "

DISTRICTS — The following special report, communicated by the Government of Burma, shows the extent of cultivation in certain districts :\*-

<sup>"</sup> In the *Prome District* it is grown to a small extent.

In the *Sandoway District* there were 282 acres of ground under cotton cultivation during the past year, and the cotton produced is believed to be of the indigenous Asiatic kind. The cultivating season commences about October. The quality of cotton hitherto grown has been very poor.

In the Akyab District the area of ground under cotton cultivation is about 940 acres. The seeds are planted with other miscellaneous growths on the hill-side, about May. The cotton can be used about February. The cost is about R15 per acre, and the profit about R30. The hill-sides are cleared of jungle and the soil turned up with rude ploughs. The floss is employed in the manufacture of cloths, and wearing apparel, thread, &c, and the productton is worth about R30 per acre.

In the *Skwegyin District* it is grown in small quantities on the Karen hills, especially up Dondami Choung.

In the *Toungoo District* it is cultivated by Burmans and Shans to a moderate extent. There are two kinds, one with white and the other with yellow flowers. It is planted in May.

In the Amherst District it is grown on the banks of the Sal ween river from indigenous seed. The area under cultivation in 1887-88 was 556 acres. It is sown in September and October, and reaped in January and February. The seed is planted upon alluvial soil collected on the river banks during inundation. The produce is consumed locally in the native looms, and none is exported. The estimated outturn of clean cotton is about 1,430 cwt., and the retail price Ri-8 to R2 per viss."

RACES.—The only specimens of cotton which the authors have seen

Districts. 229

Races. 230

Methods.

GOSSYPIUM.

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Cotton Cultivation in

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| CULTIVATION<br>in<br>LOWER<br>BURMA.<br>Races. | from Lower Burma correspond with G. Wightianum, Tod. In 1882;83<br>experiments were made in the Arakan Hill Tracts and Sandoway with<br>seed of the Bamia and other Egyptian varieties of cotton (G. $\pounds V_{15}^{st}$ util $\pounds^{st}$ .<br>They were not, however, successful. In a report for 1868-69, published ov<br>the Cotton Commissioner for the Central Provinces and the Berars, it is<br>stated that a variety of Persian cotton closely allied to the Egyptian grows<br>exceedingly well about Rangoon at all seasons and yields a fine wnile<br>cotton of strong staple. A more recent allusion to this exotic cotton can-<br>not be discovered, though the subject is interesting. Mason, however,<br>states in his •• Burma and Its People," that Peruvian and Sea "Iana<br>cotton were at one time introduced experimentally, but that in Burrna, as<br>in most other parts of India, they appear to have taken little hold, But<br>it may be added that in 1831, Major Burney contributed to <i>tintAggi</i> .<br><i>Horticultural Society of India</i> , samples of Pernambuco cotton, called in<br>Burmese Shembanwa, or ship-cotton, which had been grown near Ava.<br>The plant he described as growing into a lofty tree as thick as the thigh,<br>yielding its cotton in February, March, and April (Trans., IL, 124).<br>Mr. Edward Riley, in a Paper on the Agricultural Capabilities of the<br>Province of Amherst (1838), refers to the same cotton as occurring in<br>the lower jungles in a state of acclimatisation. Commenting on this plant,<br>however, he admits that the attempt to introduce it as an agricultural<br>crop had failed, though he expresses the opinion that the failure was due<br>to a misjudgment of the kind of soil best suited to the crop. This is pro-<br>bably the cotton referred to, in the Note on Upper Burma, as having<br>been introduced by King Min Doon Min. In 1841 Dr <sub>6</sub> Wallich brought to<br>England samples of Martaban cotton collected from the Pernambuco stock.<br>The floss was pronounced inferior to none, either in the quality of its staple<br>or the ease with which it could be separated from the seed. (Journ. Agri-<br>Hort. Soc. Ind. (O |
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| Trade.<br><b>Z'31</b>                          | ,,f. ANALYSIS OF THE TRADE.—In the <i>Provincial Cotton Report for 1882-83</i> , if-is stated that none of the cotton grown in Lower Burma is exported from the Province, an assertion that would appear to be confirmed by the relation between the imports and exports. The land trade in cotton is wholly confined to imports by river and overland from Upper Burma. The greater part of the exports by sea is shipped to China, either direct                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| UPPER<br>BURMA.<br><b>232</b>                  | or through the Straits Settlements.<br>II. UPPER BURMA—Trustworthy cotton statistics are not available re-<br>garding the area, outturn, and trade of Upper Burma, as a whole. The<br>following valuable reports by the Deputy Commissioner of Meiktila, and<br>from other districts, however, are sufficient to shew that cotton cultivation<br>exists, to a considerable extent, at least in certain tracts, and is probably<br>capable of extension:—<br>"Cotton is grown to a considerable extent in the Mahlaing sub-divi-<br>sion—in fact it may be said to be the staple product. In other parts of the<br>district it is grown to a small extent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Raees.<br>233<br>Area.                         | RACES.—There are three forms of cotton grown here, $viz$ :—(1), $v/a$ -gyt <sup>*</sup><br>(2), wa-galé, and (3),/>*'««*'. The flowers of 1 and 2 are white, whilst that of<br>3 is red; 1 and 2 produce the pure white cotton, whilst 3 produces *>nly<br>cotton of a light brown tint, which eventually develops into a colour similar<br>to <sup>the</sup> ordinary dark <i>khaki</i> . American cotton seed was introduced by<br>King Min Doon Min, but in this part it has turned out a failure. The ori-<br>SI!fi <sup>See</sup> f 1 <sup>1</sup> d well> but xt, failed to acclimatise. Subsequent seed deterio-<br>rated and the cultivators ceased to plant it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 234                                            | AREA UNDER CROP.—It is a difficult matter to estimate the area at<br>nt unaer cultivation, but in Mahlaing it is stated at 30,000 pes (1 pte=<br>77 acres), and mthe other parts of the district at 5,000. Taking ape<br>G, 234                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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| H                                                                                                                                                                                                                                                                                                                                                                                                               | Surma.                                                                                                                                                                                             | {Watt &                                                                                                       | Murray.)                                                                                                                             | GOSSYPIUM.                                                                                |
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| roughly to bean acre and a half<br>cotton.<br>DATE OF SOWINC AND REAF<br>picked in November and Decen<br>six baskets of seed are sown.<br>One yoke of bullocks can plou<br>cost of cultivation it will be co<br>pair of bullocks as a datum. T<br>following may be estimated:—<br>labour, R20; 2 bullocks, R30;<br>based on the presumption that la<br>the work is done by the cultiva<br>pick-d by the family. | PING—Cotton is so<br>ober. To plant a<br>The price of see<br>gh four- <i>pes</i> of la<br>nvenient to take th<br>herefore, to cultiv-<br>20 baskets of se<br>picking, Rio; to<br>obour and oxen ha | wn in May<br>of <i>pe</i> of cott<br>and, so in<br>he work of<br>vate four <i>p</i><br>red, value<br>tal R62. | y and June<br>ton from fiv<br>baskets for<br>calculating<br>one man an<br><i>es</i> of land<br>R2; 1 m<br>This estima<br>nired. As a | and UPPFR<br>BURMA.<br>se to<br>r Ri.<br>g the<br>nd a<br>the<br>ian's<br>ate is<br>rule, |
| YIELD PER ACRE.—The yie<br>viss (3'66&) per pe; 250 is look<br>good one, so an average of 400<br>ing at some idea of the profits.                                                                                                                                                                                                                                                                               | ed upon as a very<br>viss may be take                                                                                                                                                              | y poor cro<br>n, for the p                                                                                    | p, and 500<br>ourpose of a                                                                                                           | as a 236<br>arriv-                                                                        |
| PROFITS.—The cotton as j<br>that is, R40 per pè or R160 for<br>follows:—<br>To cost of cultivating 4 pès of<br>s, sale of 1,600 viss of cotton                                                                                                                                                                                                                                                                  | four <i>pès</i> . Therefo<br>land •                                                                                                                                                                | ore, the ac                                                                                                   | $\begin{array}{c} \text{for Rio a } 100\\ \text{count stand}\\ R\\ 62\\ \underline{160}\\ -\underline{98}\\ \end{array}$             | ds as 237                                                                                 |
| If the cultivator takes the troub<br>100 viss, which would make his<br>METHOD OF CULTIVATION<br>seed is sown broadcast, and bey                                                                                                                                                                                                                                                                                 | s profits considera<br>N.—The land is plo                                                                                                                                                          | bly greater<br>bughed and                                                                                     | r.<br>d cleaned.                                                                                                                     | The Method.                                                                               |
| the earth round the young plan<br>NATURE or SOIL.—It is diff                                                                                                                                                                                                                                                                                                                                                    | nts, nothing more<br>icult to say where                                                                                                                                                            | is done.<br>cotton will                                                                                       | not grow.                                                                                                                            | I <sup><b>t is</b> Soil.</sup>                                                            |
| found in the heavy black soils (v<br>red marls, and in the alluvial de<br>ple grow cotton and pulses wh                                                                                                                                                                                                                                                                                                         | posits alongside r                                                                                                                                                                                 | ice lands.                                                                                                    | In fact, the                                                                                                                         | e peo-                                                                                    |
| TOTAL OUTTURN.—Taking<br>and an average yield of 400 vis<br>be 14,000,000 viss, or in roun<br>600 tons of cleaned cotton. Th                                                                                                                                                                                                                                                                                    | the acreage under<br>to the <i>pè</i> , the ou<br>d numbers, say,                                                                                                                                  | er cultivati<br>tput for th<br>2.000 tons                                                                     | on at 35,00<br>is district<br>, equal to a                                                                                           | 0 pes Outturn.<br>wouki 240<br>abouti                                                     |
| is used for home consumption.<br>CLEANING.—The floss is<br>by foot treadle, after which it i<br>marketable condition as raw co<br>twist on the old-fashioned whee<br>The specimens enclosed w<br>as follows :—                                                                                                                                                                                                  | s beaten and hand<br>otton. For domes<br>el and then woven                                                                                                                                         | d-picked.<br>stic purpos<br>i into cloth                                                                      | It is then<br>es it is spur<br>''                                                                                                    | in 7a 241<br>nintoo                                                                       |
| 1. Wa-gyi, Gossypium ac<br>2. Wa-gale <sup>4</sup> G. Wightian<br>3. Pinni, G. neglectum,<br>Yomah and name<br>a hybrid between G                                                                                                                                                                                                                                                                               | um, <i>Tod.</i><br><i>Tod,</i> Kurz's 12<br>ed G. herbaceum<br>5. Wightianum ar                                                                                                                    | , <i>Linn., v</i><br>nd G. negl                                                                               | <i>ar</i> . hirsutu<br>ectum.                                                                                                        | ım, <sup>–</sup> is                                                                       |
| From a report recently re<br>would appear that cotton is cu<br>extensively in the Lower Chino<br>Upper Burma, and to a fair<br>staled that in the Ruby Mine<br>seen in gardens. No returns<br>crop. In the Lower Chindw                                                                                                                                                                                         | eceived from the<br>altivated sparsely<br>lwin District, and<br>extent in the B<br>s District two ''y<br>have been receiv                                                                          | Governme<br>in the Ma<br>in the Eas<br>hamo Diss<br>varieties''<br>ved of the                                 | ent of Burr<br>andalay Dis<br>stern Divisi<br>trict. It is<br>are occasic<br>area unde<br>n in Marcl                                 | strict,<br>ion of<br>s also<br>onally;<br>er the                                          |

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| GOSSYPIUM                         | Cotton Cultivation in the Andamans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| CULTIVATION<br>In UPPER<br>BURMA. | April, and collected from September to December, and the floss is satd to sell from <b>R13</b> to R14. per 100 viss.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Trade.                            | " In the <i>Bhamo District</i> the plant grown has 3 to 5-lobed leaves (small), with a flower usually whitish, often yellow, and sometimes pale pink, it is grown pretty extensively."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 242                               | ANALYSIS OP THE TRADE.—NO statistics of the cotton trade of ${}^{II}PP \oplus^{r}$<br>Burma are available. A large proportion of the exported produce of the<br>lower districts is imported into Lower Burma, either for use there, or tor<br>transmission to Rangoon. It is believed that a great part of the produce<br>of the upper districts are exported trans-frontier to China. In the $A^{ru^{m}}$<br><i>Horticultural Society of India Journal (Old Series), XL, 584, it IS</i><br>stated that, " according to the records of the old Burmese customs, the ex-<br>ports at one time reached the large amount of 30,000,0001b annually^ and,<br>in after years, the Resident at the Court of Ava, Colonel Burney, reported<br>that Burma exported to China fully 4,000,000a, and a like quantity <i>via</i> the<br>Arakan mountains, Chittagong, and Bengal."                         |
| CULTIVATION<br>in<br>ANDAMANS.    | 14. ANDAMAN AND NICOBAR ISLANDS.<br>References. — Proceedings of Dept. of Rev., Agri. and Commerce, Govt*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 243                               | of India, Nos 6 and 7, July 22nd, 1871; Nos. 1, 6, and 7, July 1872.<br>In 1869, Colonel Man, in his report on the Nicobar Islands, remarked                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                   | that the soil and climate appeared to be well adapted for the growth of Sea<br>Island cotton, and that it would be well to try the experiment. Seed was<br>accordingly obtained and sown, together with that of what Colonel Man<br>calls the indigenous cotton. Both did well, but the American plants<br>were largely attacked by beetles and other insects. Samples of the "indi-<br>genous cotton " were subsequently forwarded to the Bombay Chamber of<br>Commerce and pronounced much superior to any grown in India, superior,<br>indeed, to any American race except the finest Sea Island. Its cotton                                                                                                                                                                                                                                                                               |
| a.                                | was found to greatly resemble Brazilian, having adherent seeds, and an excellent long, strong staple. Specimens of the plant were examined by Mr. C. B. Clarke, who pronounced them to be Gossypium acuminatum.<br>'Conf. with p. 23).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   | Samples of both were afterwards sent to England, where they were<br>submitted for valuation to the Liverpool Cotton Brokers' Association, with<br>the result that the "wild " cotton was valued at <i>ud</i> . to <i>i2d</i> . per ft, the Sea<br>Island at <i>2od</i> . to 24 <sup>^</sup> . per ft. The latter was said to be very irregular in<br>staple; part of the sample was long and fine, worth from 33d. to 36c <sup>*</sup> . per ft<br>but other portions so much inferior that the whole would not fetch more<br>than $\langle 6d$ . to 19//. per ft.<br>In 1872 experiments were made with Hinganghat,Sea Island, Egyptian<br><i>Jari</i> , New Orleans, and Dharwar, but none of these, except perhaps the<br>form of G. barbadense found by Dr. Prain in the Andaman Islands ( <i>Conj</i><br><i>with p. 20</i> ) proved equal to the reputed native cotton above alluded to. |
| GINS ft<br>GINNING.<br><b>244</b> | GINS AND GINNING.<br>References.—Watson, Report on Cotton Gins, i87g; Agri-Hort. Soc. of<br>India, Transactions, V., 187 / VIII., 301; Journals (Old Series): If<br>Sel., 203; V., 83-100; VI., 222, proc, xx., xc; VII., 35, 189; VIII., 161<br>*74* '75f XIII., proc., xfoi. / XIV., proc, xv., hit.'<br>The methods of cleaning cotton in India, as will have been seen from<br>the above provincial reports, are primitive in the extreme. Indeed up to<br>twenty years ago mention is frequently made of cotton being picked by<br>hand, in which manner one woman could clean one to one-and-a-hal<br>pounds of fibre per day. In all the chief cotton-growing districts, how<br>ever, there have been in existence from time immemorial two simple form<br>of machine for the purpose, viz., the foot-roller and the churka. Of these<br>G <sub>1</sub> 244                            |

# **Gins and Ginning:**.

(Watt & Murray.) GOSSYPIUM?

the foot-roller is used only locally in a few places, and is alone adapted to the hard-seeded Indian cottons. By it the fibre is cleaned as follows :the cotton is spread over a smooth flat stone of from one to two feet square, sometimes square, sometimes round; an iron rod 18 inches long, thick in the centre, tapering towards the extremities, is placed on the stone, and rolled forwards and backwards by the feet of the worker. Sometimes the rod is shorter and slightly conical, in which case the motion is circular, round and round the stone. Under the combined influence of the rolling motion and the pressure of the feet, the seed is squeezed out and pushed <sup>a</sup>way in front of the roller, leaving the cleaned fibre behind. One worker can in this way turn out from four to six pounds of cleaned cotton in a day.

The usual implement employed, however, is a simple double roller machine called the *churka*. This has been already described (see pp. 94, 106, 123) and need not be further discussed. Suffice it to say, that the essential parts of the machine are two rollers, either both of wood, or one of wood and one of iron. To these a revolving motion towards each other is communicated by means of a crank or wheel at one or both ends. The effect is, that the cotton is presented at one side of the revolving<sup>1</sup> cylinders, and the fibre is drawn through and pulled off the seed, which is too large and hard to pass through. On an average the *churka* produces from six to eight pounds of clean cotton per day for each man or woman engaged in the work.

The common *churka* is evidently liable to many imperfections. The feeding being done by hand it is necessarily impossible to keep the whole length of the rollers constantly supplied, so that the machine is never worked up to its actual ginning power, though, at the same time, there is now and then in places such an excess of seed-cotton that the rollers become clogged. As a consequence of this clogging, the surface of the wooden roller or rollers is liable to become worn in lines or narrow grooves, which tend to diminish the girip of the rollers on the cotton and eventually allow seed to pass through into the heap of cleaned fibre. In the case c2 the Guzerat *churka*, which has one small iron and one large wooden roller, the surface velocities of the two are unequal, consequently the tuft of cotton is exposed to an injurious grinding action.

exposed to an injurious grinding action. The smooth and gentle working of the *churka* has suggested many mechanical adaptations of its principle, and numbers of roller gins have been constructed with the idea of preserving this gentle action, whilst increasing the outturn and diminishing the rapid wear of the rollers. "Im-proved mechanical feeding, arrangements for preventing the coiling of clean cotton round the roller, and contrivances for regulating the grip and the motion of the two rollers have been added to the simple native machine without, however, achieving any definite practical success." (*Watson.*) This being the case, attention was directed to American gins, which have now been largely introduced into the country. In the year 1792, Eli Whitney, an American, invented the saw-gin, a machine which, under various modifications, is still employed for cleaning the greater propor-tion of the cotton grown in the Southern States. It consists of a series of " saws " (in reality discs with hooked blunt teeth), revolving between the interstices of an iron bed which forms the base of a large box or hopper. The fibre is caught up by the hooks and pulled through the interstices, leaving the seeds behind. Since the fibre of certain of the long-stapled. cottons was found to be more or less cut, crushed, or broken by the action of the saw, a more recent American invention, the Macarthy gin, came largely into use for cleaning Sea Island, Egyptian, and Brazilian came largely into use for cleaning Sea Island, Egyptian, and Brazilian cotton. In this gin the fibre is drawn by a leather roller between a metal plate called the  $\leq$  doctor," fixed tangentially to the roller, and a blade

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| <ul> <li>in 1829, when the Court of Directors stated that they had at several times sent different machines to India, with the hope of bettering the condition in which their cotton reached England, and amongst these "two of a Jiev instrument called Whitney's saw-gin." Other American gins had 10 merly been sent to India, and on one occasion under the charge of an American mechanic; two gins had also been made by Mr. Maudsley for the Company, but all alike had failed. Writing in 1839, the Court of Directors again state that the American machinery, which up to that time had been sent out to India, had not succeeded.</li> <li>Attention was consequently again directed towards improvements in the native churka, and in 1848 a Mr. Mather was employed by the Government of the North-West Provinces to improve that machine. He shortly afterwards exhibited a working model of an improved churka which obtained the approval of a committee. This body recommended that twelve similar instruments should be constructed. These were, ac cordingly, made in Calcutta, and in 1849 eleven were sent to Agra for trial In 1848, the Apri-Horicultural Society awarded a prize of KS00 to Mr Mather for this machine, and in 1849 orders were issued by Government to construct ninety-six such churkas, being eight sets of twelve each. If 1880, these were procured at a total cost olover R20,000, and twenty-nine were distributed. After this large expense had been incurred the machine "-xyere found to be inferior in every way to the native churka and turned ou less cotton for the power employed, and that too in a dirtier and less satis factory state. Finally, all were advertised for sale in Calcutta, and the 65 which had not been distributed, were sold by manual labour in Manchester and reported very highly on them, with the consequence that 48 wer ordered to be sent to India in 1849. These were found to answer we when fitted with small gratings suice to India not the recommendation of the <i>Agri</i>. <i>Horicultural Society of India</i>, offered a prize</li></ul> | GOSSYPIUM | Gins and Ginning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| up to the present considered specially adapted. Some of the fuelds con                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           | called the "beater," which moves up and down in a plane immediately behind and parallel to the fixed plate. As the cotton is drawn througn by the roller the seeds are forced out by the action of the moveable bl". <sup>3,5</sup> which, in some machines, is made to work horizontally instead of vertically. Many improvements have been made on the original and simple forms of both machines, for a description of which the reader is referred to Dr. Forbes Watson's valuable Report on Cotton Gins. The first notice of the introduction of foreign gins into India occurs in 1829, when the Court of Directors stated that they had at several times sent different machines to India, with the hope of bettering the condition in which their cotton reached England, and amongst these " two of a Jievy instrument called Whitney's saw-gin." Other American gins had for merly been sent to India, and on one occasion under the charge of an American mechanic; two gins had also been made by Mr. Maudsley for the Company, but all alike had failed. Writing in 1839, the Court of Directors again state that the American machinery, which up to that time had been sent out to India, and not succeeded. Attention was consequently again directed towards improvements in the native churka, and in 1848 a Mr. Mather was employed by the Government of the North-West Provinces to improve that machine. He shortly afterwards exhibited a working model of an improved churka which obtained the approval of a committee. This body recommended that twelve similar instruments should be construct. These were, accordingly, made in Calcutta, and in 1849 orders were issued by Government to construct minety-six such churkas, being eight sets of twelve each. In 1850, these were parcured at a total cost tover R2(000, and thenty-nine were distributed. After this large expense had been incurred the machines "-were found to be inferior in every way to the native churka and the effectory state. Finally, all were advertised for sale in Calcutta, and the 65. which had not bece meths the functi |
| G. 244                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           | up to the present considered specially adapted. Some of the ideas com<br>G. 244                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Gins and Ginning.

*{Watt & Murray.)* 

monly entertained upon the subject are far from being correct. The great advantage of saw-gins has been supposed to consist in the rapidity of their work and their economy in the consumption of power. This opinion was well founded in the days when a 40-inch Macarthy gin was not expected to turn out more than from 8 to 128) of clean cotton per hour. At the present time the construction of Macarthy gins of all kinds is greatly improved; in fact, the improvements effected in the knife-roller gin during the progress of the trials, and which may fairly be regarded as having resulted from the experience gained at the trials, have rendered it possible to obtain a rate of outturn of as much as 120 or even 200ft of clean cotton per hour, and this with a smaller consumption of power than that required for saw-gins, thus surpassing the latter both in outturn and in economy of power. Even the common double action Macarthy gin, when compared with saw-gins of a similar price, and worked at the moderate rate of speed at which alone it is safe to employ them, will probably have the advantage as regards rate of outturn though not as regards consumption of power. On the other hand, it was usually supposed that cotton was more liable to be cut by the saw-gins than by the roller gins, and a good deal of ingenuity has been devoted to the discovery of a form of tooth which would reduce the cutting action of the saw to a minimum. Without denying that the shape and size of the teeth may have some influence, and are, therefore, worthy of attention, it has been proved that, errors of adjustment excepted, the cutting and tearing action in all systems of gins is mainly determined by the striking speed, and that with a similar striking speed no great difference in this respect has been observed between the different systems of gins. In fact, the greatest amount of cutting action observed at the trials was exhibited, not by saw-gins, but by roller-gins running at an excessive speed. The great diameter of the striking part in the case of saw-gins, however, renders it particularly necessary to avoid any high rates of speed, as otherwise the permissible limits of striking speed may soon be exceeded. It may be observed that, in the Uilited States, where the saw-gins are usually worked at a moderate speed and where the fibre of the cotton does not adhere very strongly to the seed, comblaints as to the cutting action of the seed are always less frequent than in India, where the gins are frequently drawn at an excessive rate, and where the strong attachment of the fibre to the seed renders the staple specially liable to injury.

"But the one real drawback to the use of saw-gins is their tendency to 'nep<sup>5</sup> the cotton, although even this defect is greatly diminished by employing a moderate speed. A certain amount of nepping is produced even in the case of Macarthy gins, but the defects to which the Macarthy-ginned cotton is peculiarly exposed are curling and twisting, faults which may give rise to 'neps' during the subsequent carding of the cotton. It is thus only at the carding engine that the different samples of cotton can be compared in this respect." • • • • "The observations gave a clear result in favour of the Macarthy gins, their average 'neppiness' amounting to 2\*2 (out of a possible 3) against 3\*4 degrees in the case of saw-gins. The increased 'neppiness/ moreover, appears to be usually accompanied by a certain diminution in the strength of the yarn.

"But, on the other hand, the use of saw-gins offers one undoubted advantage over the Macarthy gins in the greater cleanness of the cotton which, under certain conditions, it is possible to attain by their use. Most sawgins possess mote-boards, fixed in such a position under the saws and brushes that a certain proportion of the leaf, crushed seed, and other coarse impurities, thrown off by the centrifugal force imparted by the rapidly revolving brushes is retained by them. As regards the quality

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of the cotton, if a saw-gin be driven at such a moderate speed as not to cut the cotton, the opinions for or against its use will depend in each particular instance on whether more importance is attached by the valuer or spinner to the cleanness of the cotton, or to its 'neppiness.'" . . , ""<sup>The</sup>  $2^{\Lambda n}$ !ftt conclusions just arrived at are of some importance in considering the tutur" of cotton cultivation in the Southern Mahratta country. At the present time the whole of the acclimatised American cotton, produced in the unarwar and adjoining districts, is cleaned by the saw-gins which were originally supplied by the Dharwar Government Factory, and it may be esu mated that there are at the present time (1879) about 3,000 of these in the hands of the rayats.

<sup>if</sup> The cotton cleaned by these gins, however, even when they are in perfect condition, is proved by thelresults both of the valuations <sup>ai</sup>V?.<sup>o</sup> I the spinning experiments to be inferior in quality to that prepared by the <code>htest</code> American gins." . . • "Not only does the cotton prepared by the <code>htest</code> marries a sw-gin present the unavoidable defects of saw-ginning (that is, neppmg and cutting if the gin has been driven at too high a speed), but it does not possess, to any extent, the compensating advantage of cleanness. In tact it is one of the gins which produce the largest quantity of broken seed,. considerably more indeed than a well-adjusted Macarthy gin. This is particularly the case with the Dharwar-American cotton; in fact, the unexpected result was brought to light that the native varieties of cotton appeared to be, on the whole, less injured by the Dharwar saw-gin than the American cotton for which it was specially intended." (off. P'/^'-l . . . <sup>u</sup> As the Dharwar'gin, even in the perfect condition in whicn it was tested at the trials, has been shown to be inferior to the American gins now in use, it follows that, in the neglected condition in which these gins are frequently found in the Dharwar district, many of them not having been set or repaired for years, this inferiority must be immensely increased.

Dr. Forbes Watson then goes on to discuss the best means of re,medyifsg the then existing state of matters, which was year by year contributing so largely to lower the position of the Dhárwár-American cotton. After comparing the relative merits of the Macarthy and saw-gins, he arrives at the conclusion that " until the introduction of steam power on a large scale, gins of the type of saw-gins must be mainly relied on for cleaning the Dhárwar crop." He recommends a modification of the Emery gin as likely to prove most useful, and continues, " But in the meantime it appears possible to utilise, to some extent, the existing saw-gins. A certain advantage would be obtained by simply reducing the speed, which could be easily done by merely increasing the diameter of their driving pulleys. A speed of 200 revolutions per minute would very nearly correspond to the striking speed of 100 inches per second, which has been fixed as the approximate limit, every increase above which is injurious to the staple of the cotton.<sup>5</sup><sup>^</sup> . , "A more material improvement would be obtained by the substitution of the Emery saws and grids, or even by the replacement of the saws above, which could be effected at a moderate cost."

Up to the present day nearly all the indigenous cottons of India are hand-ginned by the ordinary *churka*; indeed, it appears doubtful if the American saw-gin will ever obtain a hold for this purpose. Notwithstanding the proof to the contrary, brought forward by Dr. Forbes Watson, reports are still frequent that the native cotton is much damaged by the saw-gin. It is possible that this may be due to imperfections in adjustment, excess of speed, and general carelessness, but it appears doubtful if it is entirely so, since by the same machines American cotton is improved in ginning. Moreover, the *churka* being, as already stated, almost entirely worked by women of the cultivator's household, whose labour

(Jinning and Pressing. {Watt & Mutt ay) GOSSYPIUM.

and time cost practically nothing, can never be replaced by an expensive niachine, unless the increase of value of the product should prove sufficient to more than cover the outturn involved by its use. The only case in which the saw-gin is said to produce a higher quality fibre from indigenous "*kapds*" than the *churka*, is that of Sind, where the machine is reported to be consequently "much appreciated by the people." This fact is confirmed by the experimental trials, and Dr. **Forbes** Watson re-Pprts that " the percentage of cleaned cotton yielded by this variety is higher than in the case of any other of the native cottons."

Dr. Forbes Watson divides the Indian cottons into two classes: (1) those easily ginned, and (2) those ginned with difficulty. To the first belong the introduced American and certain Indian races, *via.*\* Broach, Dholleras, the *jari* form of Oomras, Westerns, Coomptas, Khandesh (Vila^tip), and Tinnevellies; to the second Madras *Uppam<sub>t</sub>* Hing-anghât, Khandesh, and the *bani* form of Oomras. Of all these, the Broach and Dhdrwar growths are the only forms entirely cleaned by steam or hand saw-gins at the present time, but the quantity of Umras *{jari*} and Dholleras thus treated is yearly increasing. With the exception of *jari* and Dhollera, these are soft-seeded American races, which cannot be satisfactorily cleaned by the native *churka*. All other descriptions of Indian cotton are still entirely hand-cleaned by the *churka*, or by the foot-roller. It appears possible, however, that the Sind cotton also may soon be extensively cleaned by the saw-gin, and that the Westerns and Coomptas, classed by Dr. Forbes Watson as "easily ginned," may also be found to be more satisfactorily cleaned by the same means.

### COTTON PRESSING.

A good deal of the cotton produced in India is still sent to the seaports in bundles or *dokrahs* of about 200fe each, but the greater portion of the crop is pressed up-country ready for shipment. The method of packing these rough bundles is generally similar to that already described Utsee p. 106) and need not be further discussed.

The number of steam presses in India is increasing year by year. Mr. Beaufort, in his Indian Cotton Statistics, gives a list of 190 Cotton Steam-pressing Companies as existing in all parts of the country in 1889. Mr. O'Conor in his statistical tables, however, returns 949, of which 116 are in Bombay, 5 in Sind, 41 in Madras, 17 in the Pan jåb, 1 in Burma, 36 in Berar, 13 in the North-West Provinces, 4 in the Central Provinces, 3 in Central India, 11 in Rajputana, and 2 in the Nizam's territories. The total capital employed (so far as known) is R1,87,07,125, and the value of the outturn Ri 1,10,26,240. The head offices of the larger companies are in Bombay, but they possess steam presses in various important centres of the cotton districts such as Bombay Sind, Berar, and the North-West Provinces. Besides these, numerous smaller companies have their presses and head offices in the inland towns of Madras, Bengal, the Panjåb, the North-West Provinces, Central India, Rajputana, the Central Provinces, Berar, the Nizam's territory, Sind, Bombay, and Burma.

\* According to Mr. Beaufort, cotton is generally exported from Bombay and Karachi in bales of 3<sup>^</sup> cwt. each, or 392th net. "As the staple is bought and sold by the *candy* of 784th, two bales equal one *candy*. Formerly, at all other ports cotton was shipped in bales of 300ft net, but within the past fifteen years the trade has gradually, in Calcutta and Madras, changed the weight to 400lb net. From Coconada shipments are made in bales of both 300tb and 400ft, while at Tuticorin, of the steam presses at work, several have been converted so as to admit of

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pressing 500& bales, the others confining themselvos to 400tb bales\* Since nearly the whole of the Tinnevelly crop is sent to Bombay by coasting steamers for transhipment to European ports, and many bales burst *en route* to Bombay, thus requiring to be re-pressed before re-shipment, it may be as well to point out to those interested that there is not in Bombay a single press capable of pressing a 500ft bale. A Bombay bale is, therefore, 2-04 per cent, smaller than a Calcutta or Madras one ana 27\*55 per cent, smaller than a Tuticorin bale.

On an average, at Bombay four bales (1,568ft net) go to the shipping ton of 40 cubic feet, but some of the more modern presses turn out bales 100 of which equal 21 tons measurement. Many of the older presses have now finishers attached which, after the bales have been pressed to a certain point in the larger presses, extract the cotton and complete the process. At Karachi a space of 40 cubic feet also constitutes a sterner ton of freight, while at both ports 50 cubic feet is the sailing ship scale. On the other hand, both at Calcutta and the ports in the Madras Presidency, Coconada, Masulipatam, Madras, Pondicherry, and Tuticorin, a ton of freight, both by sailers and steamers, is on the single basis of 50 cubic feet.

The bales are covered with jute,' gunny,' cloth of Calcutta manufacture, and lashed with iron or steel bands, the latter of late years generally superseding the former owing to their lightness and greater strength. In the Government Railway returns, railway freight being payable on the gross weight of the bales, five per cent, is deducted for tare, a correct percentage fifteen or twenty years ago, but obsolete now that iron and steel bands have taken the place of jute ones. The Bombay Chamber of Commerce in their daily returns of receipts from up-country deduct but two per cent., which is approximately correct.''

#### COTTON MANUFACTURES.

1. HAND-LOOM.—Important and interesting as are the native cotton manufactures of India, it is impossible to enter into a discussion on the subject in an article such as the present which is designed to deal more especially with the raw product. The total number of hand-looms in the country, and the amount of raw material which they consume, can only be guessed at. With the increase in the number and outturn of Indian mills, and the gradual growth of the Manchester trade the manufacture of the finer textiles by the hand-loom, such as the Dacca muslins, once so famous all over the world, has almost, if not entirely, ceased. The local manufacture of the coarser kinds, however, for consumption in rural localities, and of ornamental varieties, such as the *do-pattas* of Benares, is likely to continue to a much greater extent. Sir George Birdwood (*Indian Arts, pp. 244—260*) gives an interesting and detailed account of Indian cotton goods arranged provincially. The reader is referred to that article for information regarding the technicalities of these Indian manufactures.

2. POWER-LOOM.—Mr. Beaufort has written an excellent *resume*\* of the available information on this subject, in his Cotton Statistics, from which the following may be quoted:—

"The first mill built in India was the Bombay Spinning and Weaving' Company's, which was formed about 1851, but does not appear to I.ave been in working order till 1854. The earliest return we have met with of the Indian mills, is one dated 1875, which gives the later date against the name of this concern, followed by the • Oriental,' September 19, 1855, and <sup>1M</sup>\* Throstle/ January 10, 1857. By 1861 the number in the country had increased to a dozen, containing 338,000 spindles, with an estimated annual consumption of 65,000 bales iof *zh* cwts. each) of cotton. By 1879 or just five and twenty years after the starting of the first mill, the number

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|                                                                                                                            |                                                                                     |                                                             |                                                      | Ind                                                     | ian                                                 | Cotto                                                          | n Mills.                                                                                    | (Watt                                                       | & Mur                                                                          | ray.) GO                                                                                                    | DSSYPIU                   |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------|
| had increa                                                                                                                 | sed to                                                                              | 56<br>ng el                                                 | and<br>leven                                         | the<br>yea                                              | spir<br>rs ł                                        | ndles to<br>nas bee                                            | o nearly \<br>en very re                                                                    | ∖ millio<br>markabl                                         | ns. The                                                                        | e progress                                                                                                  | MANUFA<br>TURES<br>MILLS. |
|                                                                                                                            |                                                                                     | June.                                                       | •                                                    |                                                         |                                                     | Mills.                                                         | Spindles.                                                                                   | Looms.                                                      | Hands.                                                                         | Cotton<br>consumed.<br>Bales.                                                                               |                           |
| 1879 .<br>1889 .                                                                                                           | •                                                                                   | •                                                           | •                                                    | :                                                       | •                                                   | 56<br>124                                                      | 1,453,000<br>2,763,000                                                                      | $\frac{13*000}{2i_{\rm f}600}$                              | <b>43»000</b><br>91,600                                                        | 267,600<br>888,700                                                                                          |                           |
| Increase                                                                                                                   | •                                                                                   | •                                                           | •                                                    | ٠                                                       | •                                                   | -61                                                            | 1,310,000                                                                                   | 8,600                                                       | 48,600                                                                         | 621,100                                                                                                     |                           |
| dles 90, th<br>232 pf r ce<br><i>Bomba</i><br>the numb<br>the spindl<br>3t380 to                                           | ne loon<br>ent."<br><i>y Islan</i><br>er of 1<br>les from<br>13,380                 | ns 60<br><i>nd N</i><br>mills<br>m 2<br>) or                | 6, th<br><i>Aills</i><br>s ha<br>250,00<br>298       | e ha<br>.—S<br>s ris<br>00 t<br>1 pe                    | nds<br>ince<br>en<br>o 1,<br>er c                   | emplo<br>e 1865,<br>from<br>,591,00<br>cent., 1                | yed 113,<br>, or just a<br>10 to 69,<br>0, or 536'<br>the hands                             | and the<br>quarter<br>equal<br>per cer<br>employ            | of a ce<br>to 590<br>nt., the l<br>yed from                                    | , the spin-<br>consumed<br>ntury ago,<br>per cent.,<br>ooms from<br>1 6,600 to                              | Bombay<br>Island<br>248   |
| 52,500, or<br>564,000 ba<br>(on 30th J<br>power of<br>1>59 <sup>x</sup> >°00<br><i>Bomba</i>                               | 700! j<br>ales, ec<br>une 18<br>which,<br>existin<br>av Pre                         | per o<br>qual<br>889)<br>, wh<br>ng sp                      | to n<br>are<br>nen i<br>bindl                        | , an<br>learl<br>the i<br>in w<br>es.                   | d th<br>y 1,<br>nam<br>/ork<br>- <i>co</i>          | te con<br>243 pe<br>les of<br>ing of<br>untry)                 | sumption<br>er cent. I<br>14 in cour<br>rder, will<br><i>Mills.</i> —(                      | of cotto<br>included<br>se of ero<br>add fu                 | on from<br>with th<br>ection, t<br>lly 300,<br><b>there a</b>                  | 42,000 to<br>e 69 mills<br>he spindle<br>000 to the<br>re 22, most<br>d, three at                           | Bomba<br>President        |
| Broach, c<br>gaum, and<br>one at Sh<br>country, c<br>Gokak Fa<br><i>Centro</i><br>ceived, th<br>ciation, fro<br>garding th | one at<br>d one a<br>olapore<br>one bei<br>alls nea<br>al India<br>ough a<br>om the | Bar<br>at B<br>e in<br>ing a<br>ar B<br>a.—<br>annu<br>e Go | oda,<br>how<br>the<br>at Hu<br>elga<br>-Dur<br>ually | thr<br>nugg<br>Sout<br>ubli<br>um.<br>ing<br>app<br>men | ee a<br>ger.<br>th I<br>and<br>the<br>blied<br>t of | Ano<br>Ano<br>Deccan<br>I the o<br>past<br>I for, I<br>T His H | at, one at<br>ther exists<br>a, and two<br>ther, a wa<br>four year<br>by the Bo<br>tighness | s at Jalg<br>in the S<br>ater powers<br>onbay 1<br>the Mal  | , one at<br>aon in<br>Southern<br>er conce<br>urns hav<br>Mill-own<br>haraja H | t Veeram-<br>Khándesh,<br>Mahratta<br>ern, at the<br>ve beeg rè-<br>ers Asso-<br>Holkar, re-<br>vas started | Centra<br>India.<br>250   |
| ganghất,                                                                                                                   | and N<br>68,000                                                                     | Nagp<br>), the                                              | pur.<br>e looi                                       | In<br>ms f                                              | ele<br>rom                                          | even y<br>32 to                                                | ears the 600, the 1                                                                         | spindles<br>hands er                                        | s have nployed                                                                 | lpore, Hin-<br>risen from<br>from 1,000                                                                     | Provinc                   |
| Berar.<br>but the la                                                                                                       | —The<br>atter h                                                                     | ere i<br>nas o                                              | s on                                                 | e m                                                     | ill :                                               | at Buo                                                         | dnera and                                                                                   | l anothe                                                    | r at Au                                                                        | no return                                                                                                   | Berar<br>252              |
| burga are<br>consumed<br>required o                                                                                        | the tw<br>less tover 10                                                             | r <i>rito</i><br>vom<br>than<br>),700                       | nills i<br>1,5<br>0 bale                             | in th<br>600 l<br>es.                                   | is N<br>bale                                        | Native<br>s of c                                               | State. E otton ann                                                                          | Eleven ye<br>ually;                                         | ears ago<br>last yea                                                           | one at Kal<br>the former<br>or the two                                                                      | 253                       |
| North-<br>pore and (<br>1^1879, °<br>last year f                                                                           | West<br>one is<br>ver 38,0<br>the fou                                               | Prov<br>bein<br>000<br>Ir wo                                | <i>vince</i><br>Ig pu<br>spine<br>orkin              | es.—<br>It up<br>dles<br>Ig at                          | in t<br>Ca                                          | wo mi<br>wnpor                                                 | lls consun<br>e disposed                                                                    | ned 4,80<br>1 of neai                                       | 0 bales<br>1y 25,70                                                            | g at Cawn-<br>d in 1871<br>of cotton;<br>0 bales.                                                           | 254                       |
| Calcutta<br>from 1872<br>one has r<br>nearly 250<br>have incre                                                             | or its 1<br>2). Six<br>recently<br>0,000,<br>eased f                                | neigl<br>x ha<br>y be<br>but<br>from                        | hbou<br>ve b<br>en a<br>ther<br>4,30                 | irhoc<br>een<br>idde<br>e ar<br>0 to                    | od (†<br>in t<br>d.<br>e n<br>6,3                   | the old<br>he list<br>From<br>o loon<br>300, ar                | lest dating<br>for the pa<br>164,000<br>ns workin<br>nd the con                             | g from 18<br>ist eleven<br>the spin-<br>ig. The<br>nsumptio | 804 and<br>1 years,<br>dles hav<br>e hands<br>on of rav                        | situated in<br>the second<br>but a new<br>ve risen to<br>s employed<br>w material<br>ported from            | 255                       |

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# Dictionary of the Economic

| GOSSYPIUM                                                                                                                                     | 1. Indian Cotton Mills/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MANUFAC-<br>TURES,<br>MILLS.<br>Madras.<br>256<br>Travancore.<br>257<br>Mysore.<br>258<br>Pondleherpy.<br>259<br>Mill-<br>Consumption.<br>260 | Bombay by sea, the balance being mainly received from<br>Provinces and the Panjdb.<br><i>Madras Presidency.—The</i> first two mills were started<br>'75, and in the past eleven years the number has been<br>now being nine, of which four are in Madras city, and one<br>Calicut, Coimbatore, Tuticorin, and at Ambasamudram<br>Of the nine, seven have been working throughout the<br>Tuticorin for six months only, while the mill at Coimbate<br>erected. In the eleven years, the spindles have increase<br>48,000 to nearly 153,000, the looms from <i>nil</i> to 470, the<br>from 1,000 to 4,700, and the consumption of cotton from<br>44,000 bales.<br><i>Travancore.</i> —The solitary one in this Native State is<br>consumption has risen to 4,700 bales, while the number of<br>cently been doubled.<br><i>Mysore.</i> —The two—one owned at Madras and the oth<br>are at Bangalore, and between them consume nearly 5,800<br>the spindle power being over 23,000.<br><i>P.ndicherry.</i> —U the returns are to be relied upon, the<br>this little brench Settlement consumes annually less and le<br>years ago it took 5,400 bales, last year but 2,400 bales.<br>CONSUMPTION OF COTTON BY THE MILLS.—In the f<br>eleven years, the mill consumption of the total supply av<br>cent ; m the last five years it has risen to an annual ave<br>cent. While the exports from India in the past three of<br>ranged between 1,521,000 and 1,552,000 bales, the con<br>Indian mills has risen from 726,000 to 889,000 bales, or fro<br>per cent, of the available supply. The share of each pro<br>consumption, during the year ending 30th June 1889, <sup>wa</sup> | ed in 1874 <sup>anc</sup> *<br>trebled, the tota<br>e each at Bellary<br>near Tinnevelly<br>year, the one a<br>ore is still being<br>ed from less than<br>hands employed<br>n 0,300 to nearly<br>s at Quilon. Its<br>spindles* has re-<br>her at Bombay<br>bales of cottom<br>e solitary mill in<br>ess cotton. Four<br>first six of the las<br>rerage of 33'37 P <sup>e</sup><br>fficial years have<br>somption by the<br>point of the tota |
|                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Bales of cent.                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                               | Bombay Island<br>,, Up-country Mills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 563.73O 63*43<br>103,968 11*69                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                               | Bombay Presidency total a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 667,698 75' 12                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                               | Berars 1.<br>Central Provinces<br>Nizam's Dominions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5*53<5 •62<br>26,006 2'93                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                               | Nizam's Dominions       Central India       Bengal Presidency       Nortn-West Provinces       Madras Presidency       Travancore       Mysore       Pondicherry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10,732         1*21           9,864         IMI           85,096         9'5.«           27,075         3'°5           43,750         4*93           4,718         •53           5,778         •65           2,400         '27                                                                                                                                                                                                               |
|                                                                                                                                               | Central India ,> <<br>Bengal Presidency<br>Nortn-West Provinces<br>Madras Presidency<br>Travancore<br>Mysore<br>Pondicherry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10,732         1*20           9,864         IMI           85,096         9'5.           27,075         3'°5           43,750         4*90           4,718         •55           5,778         •65                                                                                                                                                                                                                                            |

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• Conf. with foot-note, P. 52.

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**Review of the Indian Trade in Cotton.** (Watt & Murray.) GOSSYPIUM. MILLS. there were 75 in the Bombay Presidency, including 52 in the town and island of Bombay. There were 7 in Bengal, all in the vicinity of Calcutta; 8 in Madras, of which 4 were in the town; 6 in the North-West Provinces, all but one at Cawnpore; one at Indore; 3 in the Central Provinces; 3 in the Nizam's Territory; 2 in Mysore; 2 in Pondicherry, and one in Travancore. Of the 108, 50 are returned as both spinning and weaving: 53 as purely spinning mills; and 5 as entirely weaving mills. Two of the Bombay mills are stated to have manufactured hosiery in addition to yarn, piece-goods, &c. According to Mr. O'Oonor's tables, the mills contain-"They consumed about 347 miled 22,156 looms and 2,669,922 spindles. lion pounds of cotton in the year, and employed a daily average number of 92,126 persons, of whom, as far as details have been obtained, there were<sup>^</sup>3,317 men, 18,031 women, 15,309 young persons, and 3,469 children. The nominal capital of the mills worked by joint stock proprietary is returned at 95J million rupees; but there is no return of the capital of eight mills worked by private proprietary, and probably the whole capital invested in this industry is quite one hundred million rupees, or (in conventional exchange of ten rupees to the pound) 10 millions sterling. TRADE. •REVIEW OF THE INDIAN TRADE IN COTTON AND COT-262 TON MANUFACTURES. In the table (p. 56) summarising the statistics regarding the production of, and trade in, raw cotton (for the year ending March 1889), India is shewn to have produced 9,219,493 cwt. of cotton. Of that amount 7,755,741 cwt. appear to have been exported from the provinces, the bulk of which naturally went to the ports, and constituted the supply from which the exports to foreign countries were derived, vis., 5,33<sup>I</sup> »9°4 <sup>c</sup> wt., which, deducted from the above outturn, would leave 3,887,589 cwt. as the amount available for local consumption in all India, plus 64,627 cwt. obtained from foreign countries. A critical examination, however, of the returns on every aspect of the cotton industry confirms the suspicion that either the area, 13,998,639 acres, is under the mark, or that the yield per acre is under-estimated. Mr. Beaufort gives the outturn for the year in question as having been 9,625,000 cwt., but it is probable that even that amount would not meet the total transactions shown in the trade statistics. It has  $S^n$  tffi^2<sup>OT</sup>i'u<sup>thatt!</sup> e<sup>reareat</sup> kasl two errors in all the returns outturn ans  $A''**''^{the}$  T<sup>rIa</sup>?<sup>P</sup><sup>n</sup>\* of the official y« with the year of State?' To thpi <sup>thereareat</sup> kasl two errors in all the returns outturn ans  $A''**''^{the}$  T<sup>rIa</sup>?<sup>P</sup><sup>n</sup>\* of the official y« with the year of State?' To thpi <sup>thereareat</sup> kasl two errors in all the returns outturn ans  $A''**''^{thereareat}$  kasl two errors in all the returns outturn ans  $A''**''^{thereareat}$  kasl two errors in all the returns outturn ans  $A''**''^{thereareat}$  kasl two errors in all the returns outturn ans  $A''**''^{thereareat}$  so  $A''**''^{thereareat}$  with the year of State?' To thpi <sup>thereareat</sup> S'' a down the state of second the tableto the trade of Cors is down the state shown as having been less than the importsinto .... p. to attrade of India, to accept the total outturn, the imports, eports, &c, there given as correct. xas having been 9,625,000 cwt., but it is probable that even that amount Conf. with pp, 54-55, 61. ports, &c, there given as correct. In the annual statement of the trade and navigation of British India, tor 1888-89, Mr. J. E- O'Conor gives the value of the exports to foreign countries as R 15,04,56,476. Assuming that the amount retained in India was of equal proportionate value to the people as that which they sold for

tneforeign markets, the outturn may be valued at R26,0i,75,009. It is, perhaps, not, strictly speaking, correct to add together the value of a raw with that of a manufactured material in estimating trade, but this may be allowed, since these items represent actual financial transactions. The total valuation of Indian-grown cotton, plus the value of the imports of raw and manufactured cotton, last year amounted to R 57,66,93,851. The more

Value of the raw cotton exported, R 15,04,56,476; estimated value of

important branches of the cotton trade were as follows :

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| GOSSYPIUM                                                    | Review of th                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | e Ind                                                                                                                                                                                   | lian Tra                                                                                                                                                                                                | de in                                                                                                                                                                                                         |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TRADE.<br>Conf. with<br>P. 55-                               | Indian raw cotton used up in the<br>value of imports of raw and mark<br>siderable proportion of the cotton<br><b>ported and has its value thus</b><br>amounted, in the year under co<br>amount is, after all, but the value<br>and takes no account of the cotton<br>sideration of all aspects of the qui<br>total value of Indian power an<br>R18,00,00,000. But the raw cotton<br>has already been included in the<br>actions connected with cultivation<br>hence the value of the raw cotton<br>manufactures produced, may non<br>annual wholesale cotton transa<br>£60,000,000. Carrying this and<br>above data, it may be said that<br>R10,00,00,000 of home manufact<br>The subject of the Indian co<br>greater detail by reviewing the a<br>NAL TRANSACTIONS, B. EXTERN | nufactu<br>n man<br>incre<br>onside<br>of the<br>on use<br>lestion<br>nd ha<br>on fror<br>figur<br>on and<br>on em<br>t incon<br>action<br>lysis s<br>India<br>ures a<br>tton travailal | ured cott<br>nufacture<br>ased. T<br>eration,<br>e exports<br>d up by<br>and-loom<br>n which<br>res given<br>d manuf<br>ployed,<br>rrectly b<br>s of In<br>still furth<br>consum<br>and R31,<br>rade ma | ton, R31<br>ed in Ind<br>The valu<br>to 1*6,3<br>s (mostly<br>hand-lo<br>ld seem<br>manuf<br>these ma<br>. Whil<br>acture a<br>and the<br>e added<br>dia are<br>ner, by t<br>ned last<br>,00,00,00<br>y, howe | ,66,18,8<br>dia is, h<br>ie of th<br>7,45,636<br>mill ma<br>ooms. I<br>safe to<br>actures<br>anufactures<br>anufactures<br>re indep<br>ultimat<br>together<br>probat<br>he accep<br>year ap<br>0 of for<br>ver, be o | 42. A con-<br>nowever, ex-<br>nese $e^{x} P ? :$<br>anufactures;<br>From a con-<br>estimate training<br>at close on<br>at close on<br>tres are $ma \circ e$<br>so the training<br>bendent, an<br>trif so, the<br>object of the<br>proximately<br>eign gope's:<br>dealt with in                                                                                                |
| INTERNAL<br>TRADE.<br>Raw Cotton.<br>Piece-goods<br>& Yarns. | A. INT<br>I. RAW COTTON.—The interviewed in the provincial chapt<br>II. PIECE-GOODS AND YARN<br>treated separately in the '• Rep<br>and river,'' under the two head                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ERNA<br>ernal t<br>ers ar<br>S.—Eu<br>ort on<br>s of *                                                                                                                                  | nd need<br>uropean<br>the In<br>Twist a                                                                                                                                                                 | aw cotto<br>not be fu<br>and Indi<br>land Tr<br>nd Yarr                                                                                                                                                       | irther di<br>an man<br>ade of<br>i,' and <sup>c</sup>                                                                                                                                                                | iscussed.<br>ufactures are<br>India by rai<br>Piece-goods                                                                                                                                                                                                                                                                                                                     |
| "<br>Twist &<br>Xai'El*<br>263                               | &c." As in the sea-borne trad<br>manufactures exceed all other art<br>value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i>                                                                                                                                                                                                                                                                                                                                                                                                                 | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bi<br>the foll<br><i>ade</i> '' fo                                                                                               | nercial ir<br>ring 188<br>of Europ<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8                                                                                                               | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>89+,37,8<br>an impo<br>gures e                                                                                                                                          | ce. The total<br>as 2,547 lakh<br>vist and yarı<br>nds, valued a<br>43.<br>orter of twis                                                                                                                                                                                                                                                                                      |
| Twist <b>&amp;</b><br>Xai'El*                                | manufactures exceed all other art<br>Value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bl<br>the foll<br><i>ade</i> '' fo<br><i>wist and</i>                                                                            | nercial ir<br>ring 188<br>of Europ<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8                                                                                                               | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>(9+,37,8<br>an impo<br>gures e<br>39 : -                                                                                                                                | ce. The tota<br>as 2,547 lakh<br>vist and yarn<br>nds, valued a<br>43.<br>orter of twis<br>extracted from                                                                                                                                                                                                                                                                     |
| Twist &<br>Xai'El*                                           | manufactures exceed all other art<br>value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i> t                                                                                                                                                                                                                                                                                                                                                                                                                                                | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bi<br>the foll<br><i>ade</i> '' fo                                                                                               | nercial ir<br>ring 188<br>of Europ<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8                                                                                                               | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>89+,37,8<br>an impo<br>gures e                                                                                                                                          | ce. The tota<br>as 2,547 lakh<br>vist and yarn<br>ds, valued a<br>43.<br>orter of twis<br>extracted from                                                                                                                                                                                                                                                                      |
| Twist &<br>Xai'El*                                           | manufactures exceed all other art<br>"value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i>                                                                                                                                                                                                                                                                                                                                                                                                                           | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bl<br>the foll<br><i>ade</i> '' fo<br><i>wist and</i><br>Euro-<br>pean.<br>Rx.                                                   | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.                                                                   | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>(9+,37,8<br>an impo<br>gures e<br>99 : -<br>Total.<br>Rx.                                                                                                               | ce. The tota<br>as 2,547 lakh<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted from<br>Supplied from<br>(Madras an                                                                                                                                                                                                                                        |
| Twist &<br>Xai'El*                                           | manufactures exceed all other art<br>"value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i><br>Madras<br>Bengal                                                                                                                                                                                                                                                                                                                                                                                                       | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bl<br>the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>90                                                           | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.<br>Rx.<br>27                                                                             | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>(9+,37,8<br>an impo<br>gures e<br>39 : -<br>Total.                                                                                                                      | ce. The tota<br>as 2,547 lakf<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted from<br>Supplied from<br>(Madras ar<br>Bombay.                                                                                                                                                                                                                             |
| Twist &<br>Xai'El*                                           | manufactures exceed all other art<br>Value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i><br>Madras.<br>Bengal<br>Bombay                                                                                                                                                                                                                                                                                                                                                                                             | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra                                                                                                   | in commodels, du<br>boods, du<br>boods, du<br>boots, da<br>unds, val<br>each bl<br>v the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>90<br>85<br>83                                       | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.<br>Rx,<br>27<br>31<br>8                                                                  | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>89+,37,8<br>an impo<br>gures e<br>99 : -<br>Total.<br>Rx.<br>"7<br>116<br>91                                                                                            | ce. The tota<br>as 2,547 lakh<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted from<br>Supplied fro<br>(Madras ar<br>Bombay.<br>Bombay.                                                                                                                                                                                                                   |
| Twist &<br>Xai'El*                                           | manufactures exceed all other art         Value of the inland traffic in Eng         of rupees, in Indian, 474. lakhs of         TWIST AND YARN.— The t         conveyed by rail and river durin         R3,60,68,585, of Indian, 2,91,359         A clear view of the important         and yarn may be briefly convey         Mr. Tucker's '' Review of Inlant         Net Imports         Madras.         Bombay         North-West Provinces and Oudh                                                                                                                                                                                                                                                                                                                      | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tr<br>of T                                                                                            | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bl<br>the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>90<br>85<br>83<br>32                                         | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>br 1888-8<br>d Yarn,<br>Indian.<br>Rx,<br>27<br>31<br>8<br>12                                                            | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>89+,37,8<br>an impo<br>gures e<br>9 : -<br>Total.<br>Rx.<br>''7<br>116<br>91<br>44                                                                                      | ce. The tota<br>as 2,547 laki<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted from<br>Supplied from<br>(Madras an<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bengal.                                                                                                                                     |
| Twist 🎝<br>Xai'El*                                           | manufactures exceed all other art<br>Value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs of<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the important<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i><br>Madras.<br>Bengal<br>Bombay                                                                                                                                                                                                                                                                                                                                                                                             | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra<br>of T                                                                                           | in commodels, du<br>boods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bl<br>the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>\$0<br>85<br>83<br>32<br>28                        | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at F<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.<br>Rx,<br>27<br>31<br>8<br>12<br>3                                                       | nportan<br>8-89, wa<br>pean tw<br>)4 maur<br>9+,37,8<br>an impo<br>gures e<br>39 : -<br>Total.<br>Rx.<br>"7<br>116<br>91<br>44<br>3i                                                                                 | ce. The tota<br>as 2,547 laki<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted from<br>Supplied from<br>(Madras an<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay. |
| Twist 🏶<br>Xai'El*                                           | manufactures exceed all other art<br>value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the importan<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i><br>Madras<br>Bengal<br>Bombay<br>North-west Provinces and Oudh<br>Panjáb<br>Central Provinces                                                                                                                                                                                                                                                                                                                                  | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tr<br>of T                                                                                            | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bi<br>the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>90<br>85<br>83<br>32<br>28<br>19<br>11                       | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.<br>Rx.<br>27<br>31<br>8<br>12<br>3<br>11                                                 | nportan<br>8-89, wa<br>pean tw<br>94 maur<br>89+,37,8<br>an impo<br>gures e<br>99 : -<br>Total.<br>Rx.<br>''7<br>116<br>91<br>44<br>3i<br>30<br>15                                                                   | ce. The tota<br>as 2,547 laki<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted fro<br>(Madras an<br>Bombay.<br>Bombay.<br>Bombay.<br>Bengal.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.                                                                                                                                            |
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| Twist &                                                      | manufactures exceed all other art<br>value of the inland traffic in Eng<br>of rupees, in Indian, 474. lakhs<br>TWIST AND YARN.— The t<br>conveyed by rail and river durin<br>R3,60,68,585, of Indian, 2,91,359<br>A clear view of the importan<br>and yarn may be briefly convey<br>Mr. Tucker's " <i>Review of Inlan</i><br><i>Net Imports</i><br>Madras<br>Bengal<br>Bombay<br>North-west Provinces and Oudh<br>Panjáb<br>Central Provinces                                                                                                                                                                                                                                                                                                                                  | icles<br>lish go<br>of rup<br>otal a<br>ng the<br>9 mau<br>nce of<br>red by<br>nd Tra<br>of T                                                                                           | in comm<br>bods, du<br>bees.<br>amount<br>year wa<br>unds, val<br>each bi<br>the foll<br>ade '' fo<br>wist and<br>Euro-<br>pean.<br>Rx.<br>90<br>85<br>83<br>32<br>28<br>19<br>11                       | nercial ir<br>ring 188<br>of Euro<br>as 6,2040<br>ued at H<br>lock as<br>owing fi<br>or 1888-8<br>d Yarn,<br>Indian.<br>Rx.<br>27<br>31<br>8<br>12<br>3<br>11                                                 | nportan<br>8-89, wa<br>pean tw<br>94 maur<br>89+,37,8<br>an impo<br>gures e<br>99 : -<br>Total.<br>Rx.<br>''7<br>116<br>91<br>44<br>3i<br>30<br>15                                                                   | ce. The tota<br>as 2,547 laki<br>vist and yar<br>nds, valued a<br>43.<br>orter of twi<br>extracted fro<br>(Madras an<br>Bombay.<br>Bombay.<br>Bombay.<br>Bengal.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.<br>Bombay.                                                                                                                                            |

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Rx.=lakhs of rupees (1,00,000.)

#### Cotton and Cotton Manufactures. (Watt & Murray.) **GOSSYPIUM.**

TRADE— INTEENAL. " It must not be supposed," continues the author of the *Review*, "that the figures in the third column represent the whole consumption *oi* twist and varn of Indian manufacture. No estimate can be given of the produce of Twist and native spindles, which is still considerable; but putting the value of the annual outturn of Indian mills at 515 lakhs of rupees, and deducting 356 lakhs as the export to foreign countries, the home consumption of Indian mill produce alone comes to 159 lakhs against a foreign import valued at 343 lakhs."

The coastwise trade in Indian twists and yarns has been remarkably steady during the past five years. In 1884-85 the imports amounted to 20,231,819ft, valued at R93.67.197, in 1888-89 to 20,505,130ft, value £85,20,195. The largest importer in the year under consideration was Bengal, with 9,691,143ft, followed by Madras with 4\*308,051, Burma with 3>8<sup>o</sup>,i<sub>9</sub>3, Bombay with 2,153,209, and Sind with 492,534<sup>-</sup>largest exporter was Bombay, with 18,897,068ft, followed by Bengal with 2,428,851, Madras with 1,030,575%, Burma and Sind with very unimportant amounts.

The coastwise imports of foreign twist and varn have also remained steady, but are much less important than those of Indian. In the year under consideration they amounted to 10,637,127ft, valued 3^63,13,272, of which Bengal imported 4,035,666ft, Madras, 3,972,109, Sind, 934,718, Burma, 891,520, and Bombay, 803,144ft. The largest exporter was Bengal with 6,723,474ft, followed by Bombay with 3,044,486, and Madras, Burma, and Sind with smaller amounts.

Owing to its short staple the bulk of Indian cotton is unfit for the production of the finer descriptions of yarn, and local manufactures are therefore, as a whole, considerably inferior in value to that of the European article. For the same reason European yarns are largely used by native looms throughout the country in the manufacture of the finer classes of cloth.

PIECE-GOODS.—-Mr. Tucker (Review of the Inland Trade) writes: ' 'Α correct representation of this important item in the inland trade return" is attended with special difficulties. In the case of goods passing thiough the Custom House the value if declared, and the nature and volume of consignments in pieces, yards, bales or other approximate ascertained. Railway invoices, however, shew only weights in the gross without distinction of kinds, and the fixation depends upon local enquiries of a tedious and difficult nature, and upon estimates which must be largely conjectural," "To study, however, the correlation between imports by sea and the distribution of English piece-goods over the interior of the country, the inland values with all their imperfections must be accepted, for no comparison is possible between a trade represented on the one hand by pieces, yards, &c, and on the other, by maunds.'

The total value of English piece-goods, &c, conveyed by rail and river in India in 1888-89 was RŽo,26,99,428, of Indian piece-goods, 1\*1,88,64,912. The proportion received by each province may be shortly represented bj the following table:

Net hnports of Cotton piece-goods.

|                                         |              |   |   |   |   | European.         | Indian*        | TOTAL.            |
|-----------------------------------------|--------------|---|---|---|---|-------------------|----------------|-------------------|
| North-West Provinces an<br>Bengal • • • | nd Oudh<br>• | • | • | : | • | Rx.<br>399<br>836 | Rx.<br>17<br>2 | Rx.<br>382<br>834 |

Rx. = lakhs of rupees (1,00,000):

— indicates net exports.

'n

Piece-Good. 264

163

Yarn.

#### GOSSYPIUM.

#### **Review of the Indian. Trade in**

| ITRADE-<br>INTERNAL. | Net Imports of Cotton piece-g                                                                                                                   | oods—cont           | td          |                       |  |  |  |  |  |  |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|-----------------------|--|--|--|--|--|--|
| Piece-goods,         | <u> </u>                                                                                                                                        | European.           | Indian.     | TOTAL.                |  |  |  |  |  |  |
|                      |                                                                                                                                                 | Rx.                 | Rx.         | Rx.                   |  |  |  |  |  |  |
|                      | Madras                                                                                                                                          | 138                 | 30          | 108                   |  |  |  |  |  |  |
| ]                    | Panjáb . • • • • •                                                                                                                              | 281                 | 11          | 292<br>54             |  |  |  |  |  |  |
|                      | Bombay Central Provinces                                                                                                                        | 9\<br>50*           | 37<br>10    | 409                   |  |  |  |  |  |  |
|                      | Nizam's Territory                                                                                                                               | 18                  | 4           | 22                    |  |  |  |  |  |  |
|                      | Rajputana and Central India                                                                                                                     | 84                  |             | 115                   |  |  |  |  |  |  |
|                      | Berar • • • • • • • • • • • • • • • • • •                                                                                                       | 27*                 | 10          | <b>38</b> *           |  |  |  |  |  |  |
|                      | Assam • • • • • * • •                                                                                                                           | 64*                 | 2*          | , 66*                 |  |  |  |  |  |  |
|                      | Sind • • . • • • • •                                                                                                                            | 43                  | 34          | 77                    |  |  |  |  |  |  |
|                      | Rx. = lakhs of rupees (1,00,000) :<br>— indicates net exports.                                                                                  |                     |             |                       |  |  |  |  |  |  |
| l                    | By far the largest exporting centre of European goods was Calcutta                                                                              |                     |             |                       |  |  |  |  |  |  |
| -                    | followed by Bombay, Karachi, and the Madras seaports, named in order                                                                            |                     |             |                       |  |  |  |  |  |  |
|                      | of importance. Of Indian goods Bombay, Karachi, the North-West Prov                                                                             |                     |             |                       |  |  |  |  |  |  |
|                      | inces and Oudh, and Madras exported the largest quantities.                                                                                     |                     |             |                       |  |  |  |  |  |  |
|                      | The coastwise transactions in piece-goo                                                                                                         |                     |             |                       |  |  |  |  |  |  |
| -                    | ports of Indian goods last year, for example, amounted in value to R71.03,13 <sup>°</sup> «                                                     |                     |             |                       |  |  |  |  |  |  |
|                      | of European to R2,16,63,818. The largest exporting town of the former was Bombay, which shipped goods to the value of R57,59,553» $a_{TM*}$ was |                     |             |                       |  |  |  |  |  |  |
|                      | followed by the Madras seaports, the export                                                                                                     | s of which <b>y</b> | valued R 1  | 5.81 # <b>7</b> * 7'' |  |  |  |  |  |  |
|                      | Of European goods Bombay stood first                                                                                                            |                     |             |                       |  |  |  |  |  |  |
|                      | Ri,66,29,594 in value, followed by Bengal w                                                                                                     |                     |             |                       |  |  |  |  |  |  |
|                      | Though, as already stated, the figures<br>returns may not be absolutely correct, for                                                            |                     |             |                       |  |  |  |  |  |  |
|                      | the values of imports from foreign court                                                                                                        | tries. the          | broad re    | sults indi            |  |  |  |  |  |  |
|                      | cated by the statistics of internal trade ar                                                                                                    | e substanti         | ially accur | ate. Thu              |  |  |  |  |  |  |

ie statistics of internal trade are substantially accurate. they indicate very forcibly what is evident from the returns of foreign trade, vis,, the pre-eminence of Bengal as a consumer and distributor of English piece-goods. Mr. Tucker writes of the rail-borne trade: "Calcutta, which is one of the largest emporiums for piece-goods in the world, supplies the requirements of the vast population of Bengal, the North-West Provinces and Oudh, the Panjab, and Assam. It exports 13,78 lakhs of rupees against 6,87 lakhs from the other provinces combined; but the disproportion between these figures is, in some measure, caused by the higher value rates applied in Bengal to the traffic in European piece-goods. Bombay town supplies its presidency, the Central Provinces, Berar, Rajputana and Central India, and Hyderabad, and to a less extent, the North-West Provinces and Oudh, and the Panjab; while the Madras Presidency and Mysore have their demands met through the Madras seaports."

As far as can be gathered, the demand for European grey goods is much keener on the Calcutta than on the Bombay side; in bleached cloths and coloured prints it is about equal; while in handkerchiefs, shawls, &c, Bombay does the largest trade. Judging by the returns, the competition of Indian with European manufacture is much less pronounced in the case of piece-goods than in that of twist and yarn. The inland trade in country piece-goods is but one-tenth that of imported stuffs. But it must be remembered that, while the latter must necessarily all enter into the trade returns, a large local cloth manufacture exists in many parts of the country,

| Cotton                                                                                                                                                  | and                                            | Cotto                                      | on N                                | Ianuf                                      | actu                            | res.                        | (Watt & M                                                        | urray.) G                                                                       | OSSVPIUM.              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------|-------------------------------------|--------------------------------------------|---------------------------------|-----------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------|
| the produce of which<br>extent only into the st<br>that nearly all, if not<br>rail, is the produce of                                                   | atisti<br>the w<br>powe                        | cs of<br>hole,<br>er-loo                   | inla<br>of t<br>ms,                 | and t<br>he Ind<br>and                     | trade<br>dian                   | . I<br>piec                 | t may be s<br>ce-goods, dis                                      | afely stated<br>stributed by                                                    | Piece-Goods.           |
| looms is nearly altogeth<br>A considerable tra<br>is represented in the ra<br>value of imports of p<br>amounted to Ri,95,306<br>largest receiving count | ns-fro<br>il trac<br>iece g<br>; whi<br>ries y | ontier<br>de of<br>goods<br>le the<br>were | tra<br>fron<br>s an<br>e exp<br>Upp | de ex<br>tier p<br>d yan<br>oorts<br>oer B | orovi<br>rns fi<br>were<br>Surm | nces<br>rom<br>valu<br>a, K | 5. In 1888-5<br>trans-frontio<br>ued R2,19,99<br>Sibul, Kash     | 89, the total<br>er countries<br>D»33 <sup>2</sup> <sup>T</sup> J. <sup>e</sup> | 265                    |
| and the regions tapped                                                                                                                                  | •                                              |                                            |                                     |                                            |                                 | way                         | •                                                                |                                                                                 | FOREIGN                |
|                                                                                                                                                         |                                                |                                            |                                     | TRA                                        |                                 |                             |                                                                  |                                                                                 | TRADĚ.                 |
| I RAW COTTON                                                                                                                                            | .—F(                                           | or an                                      |                                     | ount o                                     | f the                           | ear                         | ly history of                                                    | f the Indian $\int_{1}^{2} \int_{2}^{2} \int_{2}^{2}$                           | Raw Cotton. <b>266</b> |
| cotton trade the reader<br>IMPORTS.—Thes                                                                                                                | e am                                           | ount                                       | ed l                                | ast v                                      | liapu<br>vear                   | r<br>to                     | 64.627 cwt.                                                      | , valued at                                                                     |                        |
| <b>R</b> 15,05,791, of which                                                                                                                            | Persia                                         | a sup                                      | plied                               | I 54,Ŏ                                     | 13 c                            | wt.,                        | Mekran and                                                       | d Sonmiáni,                                                                     | 267                    |
| 6,000, Arabia, 1,477,<br>from Egypt, the Unit                                                                                                           | and '                                          | Furk<br>ingd                               | ey ii<br>om                         | 1 Asi                                      | a, 1                            | ,273                        | 3; the rema                                                      | inder came                                                                      |                        |
| The bulk was received                                                                                                                                   | by B                                           | omb                                        | ay, v                               | vhich                                      | re-ex                           | kpor                        | ted 45 cwt.                                                      | to Persia.                                                                      | 1                      |
| In 1873, the import                                                                                                                                     |                                                |                                            |                                     |                                            |                                 |                             |                                                                  |                                                                                 |                        |
| is now, the imports in that year amounting to only 14,500 cwt. In 1877-78,                                                                              |                                                |                                            |                                     |                                            |                                 |                             |                                                                  |                                                                                 |                        |
| however, they had increased to 54,200 cwt., since which date they have preserved an average of about 50,200 cwt.                                        |                                                |                                            |                                     |                                            |                                 |                             |                                                                  |                                                                                 |                        |
| EXPORTS.—As a                                                                                                                                           | lread                                          | ly sta                                     | ated,                               | the o                                      | cotto                           | n ex                        | port trade o                                                     | of India has                                                                    | Exports.               |
| remained fairly steady                                                                                                                                  | since                                          | e the                                      | dat                                 | e of t                                     | he A                            | mei                         | rican war, b                                                     | efore which                                                                     | 268                    |
| time it presented fluctu<br>Notwithstanding th                                                                                                          | e gen                                          | s or<br>eral                               | stea                                | diness                                     | s of t                          | brui<br>he t                | nary charac<br>rade, howev                                       | ter.<br>er. progress                                                            |                        |
| has not been marked o                                                                                                                                   | luring                                         | g the                                      | past                                | t fiftee                                   | en or                           | • two                       | enty years, a                                                    | a fact which                                                                    |                        |
| is probably due, at lea<br>Indian power mills, w                                                                                                        | ast in<br>bich                                 | par                                        | t, to                               | the la                                     | argel                           | ly in<br>mot                | creased den                                                      | nand of the<br>Beaufor* to                                                      |                        |
| have consumed 3,111,0                                                                                                                                   |                                                |                                            |                                     |                                            |                                 |                             |                                                                  |                                                                                 |                        |
| the five years ending 1                                                                                                                                 | 881-8                                          | 32.                                        | 0                                   |                                            |                                 |                             | 0                                                                | -                                                                               |                        |
| The increase in the shown by the following                                                                                                              |                                                |                                            |                                     |                                            |                                 | t fif                       | ty years ma                                                      | y be shortly                                                                    | 7                      |
| Quinquen                                                                                                                                                |                                                |                                            |                                     |                                            |                                 | a of                        | Cotton                                                           |                                                                                 |                        |
|                                                                                                                                                         |                                                | Aven                                       | iges                                | ijĿ,                                       |                                 | s oj                        |                                                                  |                                                                                 | · [                    |
| Quinque                                                                                                                                                 | nnial j                                        | perio                                      | ds.                                 |                                            |                                 |                             | Weight in cwts.                                                  | Value in<br>lakhs of<br>Rupees.                                                 |                        |
| (a read of to 1929 20                                                                                                                                   |                                                |                                            |                                     |                                            |                                 |                             |                                                                  | 205*8                                                                           | 1                      |
| (0  "834-35 to 1838-39<br>(2) 1839-40 " 1843-44                                                                                                         | :                                              | :                                          | :                                   | •                                          | :                               | •                           | <b>1,191,345</b><br>i*574.75i                                    | 234-6                                                                           |                        |
| (3) 1844-45 " 1855-50                                                                                                                                   | •                                              | •                                          | •                                   | •                                          | •                               | •                           | 2,858,427                                                        | <b>?</b><br>631*5                                                               | 1                      |
| $(4)^{\pm 1856-57}$ , 1866-67<br>(5) f 1862-63, 1866-67                                                                                                 | :                                              | :                                          | :                                   | :                                          | :                               | :                           | 4.959.959                                                        | 2,885*2                                                                         | }                      |
| 1871-72                                                                                                                                                 | •                                              | •                                          | •                                   | •                                          | •                               | :                           | 5,809,586<br>4,816,023                                           | 2,001*2<br>1,350*3                                                              |                        |
| (7) 1872-73 " 1881-82                                                                                                                                   | :                                              | :                                          | :                                   | :                                          | :                               | :                           | 4,108,521                                                        | ','32*3                                                                         |                        |
| (8) 3:1877-78 " 1886-87<br>(9) 1882-83 actual year                                                                                                      | •                                              | :                                          | :                                   | •                                          | :                               | :                           | 5.367,237<br>5,374,542                                           | 1,352*2<br>1.441*2                                                              | }                      |
| 1887-88 ditto                                                                                                                                           | •                                              | •                                          | •                                   | •                                          | •                               | •                           | 5,33 <i536< td=""><td>1,441*2<br/>1,504*6</td><td>ļ</td></i536<> | 1,441*2<br>1,504*6                                                              | ļ                      |
|                                                                                                                                                         |                                                |                                            |                                     |                                            |                                 |                             |                                                                  |                                                                                 | 1                      |

The trade diminished considerably during periods (7) and (8) on the average of period (6), but recovered itself in period (9), and still more so during the last two years

• Indian Mutiny. f American War of Secession. X Famine years.

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**G. 268** 

165

| d King<br>d | akhs,<br>cwt<br>ar un<br>max<br>xport<br>w :                                                                                   | , wa<br>, the<br>nder<br>ximu<br>tts of<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | abov<br>(abov<br>hippe<br>of or<br>abov<br>(abov<br>hippe<br>of or<br>ast fir<br>while<br>, owi<br>supp<br>ited<br>eby g<br>ly lo<br>requi                 | porte<br>lest v<br>iderat<br>8,44<br>last<br>COUN<br>COUN<br>Ve fig<br>ut thr<br>d the<br>ur ex<br>those<br>ng, I<br>blies<br>King<br>iven<br>se he<br>treme<br>tined                                                | ed;   <br>yalue<br>tion t<br>2,192<br>two<br>TRY.<br>TRY.<br>gures<br>cee-fc<br>ence<br>aport<br>ears,<br>se to<br>proba<br>more<br>dom<br>for c<br>er po<br>ents (                                                                                       | but i<br>was<br>the ep<br>cwt<br>year<br>cwt<br>year<br>cwt<br>year<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>control<br>co | n 18<br>attai<br>xport<br>rs we<br>                                                                                                                                                                                                                                                                                                             | ere m<br>ere m<br>er | 5, th<br>amo<br>1 mill<br>ade<br>                                                                                                                                                                                                                                                                                                                                                                                                   | ougguntin<br>con<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | h much l<br>ng to 3,75<br>hsumption<br>efly to the<br>Cwts.<br>omit<br>1887-88.<br>3,140<br>774<br>688<br>676<br>487<br>202<br>139<br>134<br>Dee remember<br>otton sent<br>h, in fact,<br>have sho<br>ese countr<br>dia, than<br>the Suez                                                                                                                                                                                                                                                                      | wt., value<br>less, w?.,<br>i7'3 '**ns<br>combined<br>countries<br>(coo's<br>ted).<br>1888-89.<br>17.6<br>781<br>755<br>873<br>549<br>139<br>139<br>139<br>139<br>150<br>bered that<br>from India<br>, consumes<br>gdom have<br>own a ten-<br>ies are De<br>at secon<br>Canal, inc<br>ave causeo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| e yea<br>hed a<br>he ex<br>l below<br>d King<br>ia<br>um<br>ce<br>a<br>a<br>onsult<br>ge pro-<br>nglan<br>t four<br>During<br>decr<br>y to i<br>ing to<br>l from<br>ortunit<br>land t<br>ope di<br>/ is, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                  | nder<br>ximu<br>ts of<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | consist<br>in of<br>f the<br>f the<br>abov<br>(abov<br>hippe<br>of or<br>ast fir<br>while<br>, owi<br>supp<br>ited<br>eby g<br>ly lo<br>requi<br>s, des    | derat<br>8,442<br>last<br>COUN<br>COUN<br>COUN<br>COUN<br>COUN<br>COUN<br>COUN<br>COUN                                                                                                                               | tion t<br>2,192<br>two<br>TRY.<br>TRY.                                                                                                                                                                                                                    | s, how<br>burths<br>to the<br>Aus<br>ably,<br>e free<br>Sition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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cor<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie<br>chie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                         | combined<br>countries<br>(coo's<br>ted).<br>1888-89.<br>1716<br>781<br>755<br>873<br>549<br>139<br>190<br>150<br>bered that<br>from India, consumes<br>gdom have<br>own a ten-<br>ies are De<br>at secon<br>Canal, inc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| d King<br>d King d King<br>d King<br>d King d King<br>d King d King<br>d King d King d King<br>d King d                                                                   | max<br>xport<br>ww :                                                                                                           | the response of the response o | abov<br>(abov<br>hippe<br>of or<br>ast fir<br>while<br>, owi<br>supp<br>ited<br>eby g<br>ly lo<br>requi                                                    | 8,442<br>last                                                                                                                                                                                                        | 2,192<br>two<br>TRY.                                                                                                                                                                                                                                      | cwt<br>year<br>year<br>, year<br>, how<br>burths<br>to th<br>s.<br>the<br>Aus<br>ably,<br>e free<br>. Sin<br>lirect<br>sition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                         | ere m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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s<br>The                                                  | poses of<br>ich not m<br>orted), ti<br>eed, cotto<br>troubles:<br>is exist p<br>pled cotto<br>our stap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | poses of the l<br>tch not more to<br>orted), the In<br>eed, cotton op<br>troublesome<br>is exist posses<br>pled cotton, a<br>our staple."<br>The falling o | poses of the longer<br>ich not more than 9<br>oorted), the Indian<br>eed, cotton operati<br>troublesome to ma<br>is exist possessing<br>pled cotton, and in<br>our staple."<br>The falling off in<br>very marked. In | poses of the longer-stap<br>ich not more than 9 or<br>borted), the Indian fibu-<br>eed, cotton operatives h<br>troublesome to manag<br>is exist possessing mac<br>pled cotton, and in thes<br>our staple."<br>The falling off in raw overy marked. In the | poses of the longer-stapled is<br>ich not more than 9 or 10 per-<br>ported), the Indian fibre is<br>eed, cotton operatives have a<br>troublesome to manage. T<br>is exist possessing machiner<br>pled cotton, and in these qui<br>our staple."<br>The falling off in raw cotton<br>very marked. In the third                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | poses of the longer-stapled American not more than 9 or 10 per cer<br>borted), the Indian fibre is rega<br>eed, cotton operatives have refuse<br>troublesome to manage. This is<br>is exist possessing machinery she<br>pled cotton, and in thest quarters<br>our staple."<br>The falling off in raw cotton exp<br>very marked. In the thirteen | poses of the longer-stapled American<br>ich not more than 9 or 10 per cent, of<br>orted), the Indian fibre is regarded<br>eed, cotton operatives have refused to<br>troublesome to manage. This is no<br>is exist possessing machinery special<br>pled cotton, and in these quarters the<br>our staple."<br>The falling off in raw cotton exports<br>very marked. In the thirteen year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | poses of the longer-stapled American, Eg<br>ich not more than 9 or 10 per cent, of the<br>borted), the Indian fibre is regarded wit<br>eed, cotton operatives have refused to wor<br>troublesome to manage. This is not the<br>is exist possessing machinery specially adz<br>pled cotton, and in thest quarters there see<br>our staple."<br>The falling off in raw cotton exports to Cl<br>very marked. In the thirteen years 183 | poses of the longer-stapled American, Egyptia<br>ich not more than 9 or 10 per cent, of the impo-<br>borted), the Indian fibre is regarded with dis-<br>eed, cotton operatives have refused to work with<br>troublesome to manage. This is not the case<br>is exist possessing machinery encially adapted<br>pled cotton, and in these quarters there seems to<br>our staple."<br>The falling off in raw cotton exports to China y<br>very marked. In the thirteen years 1834 to<br>ombay alone averaged 47>59> cwt., in compar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | poses of the longer-stapled American, Egyptian, o<br>ich not more than 9 or 10 per cent, of the imports<br>borted), the Indian fibre is regarded with disfave<br>eed, cotton operatives have refused to work with In<br>troublesome to manage. This is not the case on<br>is exist possessing machinery specially adapted to t<br>pled cotton, and in these quarters there seems to be<br>our staple."<br>The falling off in raw cotton exports to China with<br>very marked. In the thirteen years 1834 to 18 | poses of the longer-stapled American, Egyptian, or Brazilian<br>ich not more than 9 or 10 per cent, of the imports into Engl<br>borted), the Indian fibre is regarded with disfavour. Ir s<br>eed, cotton operatives have refused to work with Indian cott<br>troublesome to manage. This is not the case on the Conti<br>is exist possessing machinery energiably adapted to the treatm<br>pled cotton, and in these quarters there seems to be a growi<br>our staple."<br>The falling off in raw cotton exports to China within the pas<br>very marked. In the thirteen years 1834 to 1846, the ex-<br>ombay alone averaged 4759 cwt., in comparison with 533                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### Cotton aAd Cotton Manufactures. (Watt & Murray.) GOSSYPIUM.

the same port to China. During the American War of 1863-64, how\* ever, not only was Surat cotton exported to America, but Bombay imported cotton from China. The erection of spinning and weaving mills after Raw Cotton-this date has gradually lessened the exports to China, and in the year under consideration they have fallen to only 139,000 cwts.

The shares taken by the seaports of India in the exports of the last two years have been as follows s-

|                                               |       |    |    |             | Cwt. (000'                       | s omitted).                      |
|-----------------------------------------------|-------|----|----|-------------|----------------------------------|----------------------------------|
|                                               |       |    |    |             | 1887-88.                         | 1888*89.                         |
| Bombay<br>Madras.<br>Bengal<br>Sind<br>Burma. | · · · | •• | •• | • •<br><br> | 3,929<br>658<br>618<br>131<br>37 | 4,198<br>595<br>375<br>130<br>32 |

The principal ports to which the exports from Bombay were consigned in 1888-89!, named in order of importance, were:-Liverpool, Antwerp, Trieste, Genoa, Havre, London, Venice, Hamburg, and Odessa. From Coconada and Masulipatam nearly all went to Havre and London; from Madras town nearly the whole used to be taken by London which still secures about four-fifths, but the trade with Italy and Austria is steadily growing; from Tuticorin about four-eighths of the whole has recently annually gone to Liverpool, while smaller quantities are exported to London, Venice, Barcelona, and Antwerp, named in order of importance. The most important receiving port of cotton from Calcutta is London, though, in the past two years, Hamburg has been rapidly pushing to the front. Genoa, Venice, Antwerp, and Trieste foljow in the order named. A litt/e of the cotton exported from Calcutta still goes via the Cape, while from al! other ports it goes entirely by the Suez Canal. About equal quantities of the exports from Karachi go to Great Britain and the Continent. London is the principal importing port, Antwerp being next, followed by Marseilles. A small and, apparently, decreasing quantity is imported by China. Most of the exports from Burma are shipped to China either direct or through the Straits Settlements.

II. TWIST AND YARN.—IMPORTS.—The total imports of twist and yarn, in the year under consideration, was 52,587,181ft, valued at 374/68 lakhs of "upees. The trade is a steadily increasing one, notwithstanding the competition of Indian yarns, as wilf be seen from the table below :--

**Ouinquennial averages of Imports of Twist and Yarn**,

| 1876-77 to 1880-81<br>1881-82 to 1885-86<br>1886-87<br>1887-88<br>1888-89 |  |  | · · · · · · · · · · · · · · · · · · · | • | 31,934,495<br>36,339,902<br>44,542,928<br>49.° 13,979<br>51,542,549<br>52,587,181 | R<br>2,72,68,650<br>2.96,16,344<br>3,31,97,40i<br>3,31,83,769<br>3,58,19,061<br>3,74,67,969 |
|---------------------------------------------------------------------------|--|--|---------------------------------------|---|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|---------------------------------------------------------------------------|--|--|---------------------------------------|---|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|

The above figures shew that, while the quantity imported has largely increased during the past twenty years, the value has been augmented in a smaller proportion, indicating a considerable reduction in prices.

Twist and Yarn-Imports. 269

TRADE-FOREIGN,

Exports.

| numbers w<br>large increa<br>of Customs<br>mule 32, in<br>ently, being<br>which format<br>to confine t<br>as they car<br><sup>m i</sup> TIK r i f<br>on all cotto<br>continued of<br>Thus, in th<br>"Very littl<br>been, to a<br>remarks o<br>nishing, a<br>too, and | as declarse in<br>s in E<br>porta<br>s now<br>erly tu<br>hemse<br>mak<br>of f Act<br>of qua<br>he repuse<br>grea<br>on the                                                                                                                                      | tions<br>that<br>tions<br>that<br>treed<br>tof N<br>ods w<br>alities<br>ort fo<br>st bel<br>t ext<br>san                                                                                                                                                                                                           | d fre<br>uant<br>oly w<br>of w<br>this<br>out<br>to 20<br>ad ha<br>Marc<br>ith th<br>s or c<br>or the<br>low<br>tent,<br>ne su                                                                                                                                                                                                                                             | e of<br>ity in<br>rote<br>hich<br>num<br>cons<br>o, in v<br>ve, a<br>h 10<br>nat of<br>count<br>year<br>No.<br>disp                                                                                                                                                                                                                                                                                                                                                     | duty<br>nport<br>:- « T<br>have<br>ber<br>idera<br>which<br>th, 18<br>n oth<br>s sup<br>r end<br>33 v<br>laceo<br>t "F                                                                                                                                                                                                                                                                                                                              | 7. T<br>ed, r<br>he l<br>mor<br>can<br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b><br><b>ble</b> 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the common children in a child | ties see ~ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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                                                                                                                                                                                                                                                                                                                                                                    | lower quali<br>le twist.<br>kinds are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| unable to<br>it is report<br>defect in<br>'counts,'<br>Nearly<br>in the yea<br>next in it<br>146,500,<br>quantities<br>- <sup>1</sup> . The s                                                                                                                        | comn<br>buy cl<br>ted th<br>that<br>more<br>y the<br>r unde<br>mport<br>Belgin<br>s.<br>hares                                                                                                                                                                   | numic<br>loth, l<br>nat th<br>num<br>espec<br>whole<br>er cor<br>ance<br>um v<br>recei                                                                                                                                                                                                                             | ation<br>by re-<br>ber vially<br>cially<br>e of the<br>sider<br>was<br>with<br>ved t                                                                                                                                                                                                                                                                                       | chea<br>ason<br>oply<br>was<br>in the<br>the in<br>ration<br>Aus<br>103,<br>oy ea                                                                                                                                                                                                                                                                                                                                                                                       | of co<br>of ev<br>made<br>nose<br>mpor<br>n, sup<br>stria<br>085,<br>ch of                                                                                                                                                                                                                                                                                                                                                                          | s the<br>ost and<br>en N<br>e up<br>highe<br>ts co<br>oplied<br>with<br>and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                                                                                                                                                                                                                                                                                                                                                                                   | 1888-89-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Bengal .<br>Bombay<br>Sind •<br>Madras<br>Burma .                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                 | •                                                                                                                                                                                                                                                                                                                  | •                                                                                                                                                                        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                                                                                                                                                                                                                                                                                                                                                                    | 15,453<br>15,374<br>1,676<br>13,758<br>5,281                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 15,056<br>15,0P5<br>2,683<br>15,813<br>4,029                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                          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                                                                                                             |
| 1884-85<br>1885-86<br>1886-87<br>1887-88<br>1888-89                                                                                                                                                                                                                  | •                                                                                                                                                                                                                                                               | • •                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                          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                                                                                                                                                                                                                                                                                                                                                                    | ft<br>958,419<br>1,082,610<br>1,319,248<br>1,058,963<br>1,601,596                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>R</b><br>6,55, <b>16</b> 7<br>6,63,032<br>8,11,466<br>6,93»448<br>11,15,140                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                      | unable to<br>it is report<br>defect in<br>'counts,'<br>Nearly<br>in the yea<br>next in i<br>146,500,<br>quantities<br>- <sup>1</sup> . The s<br>in the lass<br>Bombay<br>Sind<br>Madras<br>Burma<br>The<br>sea have<br>1884-85<br>1885-86<br>1886-87<br>1887-88 | unable to buy clit is reported the<br>defect in that<br>'counts,' more<br>Nearly the<br>in the year under<br>next in import<br>146,500, Belgi<br>quantities.<br>- <sup>1</sup> . The shares<br>in the last two<br>Bengal<br>-<br>Bombay<br>Sind<br>Burma<br>Burma<br>Burma<br>-<br>The re-exp<br>sea have beer<br> | unable to buy cloth,<br>it is reported that th<br>defect in that num<br>'counts,' more espec<br>Nearly the whold<br>in the year under cor<br>next in importance<br>146,500, Belgium<br>quantities.<br>- <sup>1</sup> . The shares recei<br>in the last two year<br>Bombay<br>Sind<br>Burma<br>The re-exports<br>sea have been as f<br>:::::::::::::::::::::::::::::::::::: | unable to buy cloth, by re<br>it is reported that the sup<br>defect in that number v<br>'counts,' more especially<br>Nearly the whole of t<br>in the year under consider<br>next in importance was<br>146,500, Belgium with<br>quantities.<br>- <sup>1</sup> . The shares received to<br>in the last two years wer<br>Bombay<br>Sind • • • • •<br>Madras<br>Burma • • • • •<br>The re-exports are u<br>sea have been as follow<br>• • • • • • • • • • • • • • • • • • • | unable to buy cloth, by reason<br>it is reported that the supply of<br>defect in that number was<br>'counts,' more especially in the<br>Nearly the whole of the in<br>in the year under consideration<br>next in importance was Aus<br>146,500, Belgium with 103,<br>quantities.<br>-1. The shares received by each<br>in the last two years were as<br>Bengal .<br>-1. The shares received by each<br>in the last two years were as<br>Burma .<br> | unable to buy cloth, by reason of co<br>it is reported that the supply of ev<br>defect in that number was made<br>'counts,' more especially in those I<br>Nearly the whole of the import<br>in the year under consideration, sup<br>next in importance was Austria<br>146,500, Belgium with 103,085,<br>quantities.<br>- <sup>1</sup> . The shares received by each of<br>in the last two years were as follow<br>Bengal .<br><br><br><br><br><br><br><br><br><br>-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | unable to buy cloth, by reason of cost a<br>it is reported that the supply of even N<br>defect in that number was made up<br>'counts,' more especially in those high<br>Nearly the whole of the imports co<br>in the year under consideration, supplied<br>next in importance was Austria with<br>146,500, Belgium with 103,085, and<br>quantities.<br>- <sup>1</sup> . The shares received by each of the<br>in the last two years were as follows:—<br>Bengal .<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul> <li>unable to buy cloth, by reason of cost and dit is reported that the supply of even No. 4 defect in that number was made up by 'counts,' more especially in those higher the Nearly the whole of the imports come in the year under consideration, supplied 51 next in importance was Austria with 299 146,500, Belgium with 103,085, and oth quantities.</li> <li>-1. The shares received by each of the importance in the last two years were as follows:—</li> </ul> | unable to buy cloth, by reason of cost and difficu-<br>it is reported that the supply of even No. 40 w<br>defect in that number was made up by the<br>'counts,' more especially in those higher than 4<br>Nearly the whole of the imports come from<br>in the year under consideration, supplied 51,891<br>next in importance was Austria with 299,148<br>146,500, Belgium with 103,085, and other of<br>quantities.<br>- <sup>1</sup> . The shares received by each of the importin<br>in the last two years were as follows:—<br>Bengal .<br> | unable to buy cloth, by reason of cost and difficulty o<br>it is reported that the supply of even No. 40 was di<br>defect in that number was made up by the incr<br>'counts,' more especially in those higher than 40.<br>Nearly the whole of the imports come from the<br>in the year under consideration, supplied 51,891,075f<br>next in importance was Austria with 299,148ft, <sup>fc</sup><br>146,500, Belgium with 103,085, and other count<br>quantities.<br>- <sup>1</sup> . The shares received by each of the importing pro-<br>in the last two years were as follows:—<br>Bengal .<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Nearly the whole of the imports come from the United Kin<br>in the year under consideration, supplied 51,891,075ft, <sup>out</sup> o*. Vif <sup>W</sup><br>next in importance was Austria with 299,148ft, <sup>fol</sup> ! <sup>owecl</sup> ^y, ,<br>146,500, Belgium with 103,085, and other countries with u<br>quantities.<br>- <sup>1</sup> . The shares received by each of the importing provinces and j<br>in the last two years were as follows:—<br>Bengal .<br>15,453<br>Bombay .<br>15,374<br>Sind .<br>1676<br>Madras .<br>Burma .<br>15,281<br>The re-exports are unimportant. During the past five ye<br>sea have been as follows:—*<br><b>ft</b><br>1884-85 .<br>1,082,610<br>1885-86 .<br>1,319,248<br>1897-83 . |

\* Imports of Foreign goods, Trans-frontier, have been included in Trans-frontier trade, see p. 165. G. 269

| Persia, 23<br>several or<br>in the ro<br>>523,30if<br>EXPO<br>to 128,90<br>cent, in the<br>ally. The<br>following          | 85,9<br>ther<br>e-exj<br>ffi;<br>DRT<br>06,76<br>he la<br>e in<br>table | 95^<br>court<br>Sind<br>S.—<br>4ft,<br>st si<br>crease<br>€ :=- | to A<br>ntrie<br>trac<br>, I,i8<br>-The<br>valu<br>x ye<br>se d | Aden,<br>s. T<br>le w<br>Biffi;<br>expo<br>ed at<br>ars, t<br>uring | 165,<br>The sl<br>ere a<br>Mac<br>orts o<br>t 1*5<br>that is<br>g the | 2751t<br>nares<br>is fo<br>lras,<br>f cott<br>,20,70<br>s, at<br>past | to<br>take<br>bllow<br>34,6<br>on ya<br>on ya<br>0,996<br>a rate<br>twei | Aral<br>n by<br>s:—1<br>27ft;<br>arn a<br>. T<br>e of 1<br>nty <u>y</u> | bia,<br>eac<br>Beng<br>Bi<br>nd t<br>hey<br>more<br>year | and<br>ch of<br>gal,<br>urma,<br>wist i<br>have<br>e thar<br>s ma            | small qu<br>the prin<br>29,632ft;<br>12,855ft<br>n 1888-89<br>increase<br>26 per 6   | amounted<br>ed 158 per<br>cent, annu-<br>own by the                                                              | TRADE-<br>FOREIGN.<br>Twist and<br>Yarn-<br>Exports.<br>270 |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 3<br>1871.72 to<br>1876 77 to<br>1881-82 to<br>1886-87<br>1887-88<br>1888-89<br>By far the<br>by the fol                   | 1880-<br>1885-                                                          | 81<br>86                                                        | prop                                                            |                                                                     | on of                                                                 | the e                                                                 | xpor                                                                     | ts go                                                                   |                                                          | ft<br>4»37<br>19,52<br>54,03:<br>91,80<br>''3*45<br>128,90<br>o Ch<br>the la | 0,329<br>4,665<br>5,981<br>4,244<br>1,375<br>6,764                                   | R<br>20,96,007<br>86,55,305<br>2,06,16,340<br>>33>68,608<br>1,07,73,865<br>5,20,70,996<br>hay be seen<br>ears :— |                                                             |
|                                                                                                                            | 10w1                                                                    |                                                                 |                                                                 | 5110 W                                                              |                                                                       |                                                                       | <u></u>                                                                  |                                                                         |                                                          |                                                                              | <u> </u>                                                                             | s omitted).                                                                                                      |                                                             |
| _                                                                                                                          |                                                                         |                                                                 |                                                                 |                                                                     |                                                                       |                                                                       |                                                                          |                                                                         |                                                          |                                                                              | 1887-88.                                                                             | 1858-89.                                                                                                         |                                                             |
| China •<br>Japan .<br>Aden .<br>Straits<br>Asiatic Tur<br>Java .<br>Arabia<br>Persia<br>East Coast<br>Ceylon<br>Other cour | of A                                                                    | •                                                               |                                                                 |                                                                     | •                                                                     | •                                                                     | * * * * * * * * * * * * * * * * * * * *                                  | •                                                                       | • • • • • • • • • • • • • • • • • • • •                  | •                                                                            | 92,57*<br>17,391<br>1,354<br>981<br>365<br>283<br>279<br>79<br>66<br>32<br><b>50</b> | 101,248<br><b>23,143</b><br><b>1,3.7</b><br><b>,544</b><br>503<br>327<br>261<br>139<br>04<br>26<br>24            |                                                             |
| seaboard                                                                                                                   | pre<br>by                                                               | sider<br>the                                                    | icies<br>follo                                                  | and                                                                 | pro                                                                   | vince                                                                 | s als                                                                    | 60 CO                                                                   | ontri                                                    | bute                                                                         | small at                                                                             | the other<br>nounts, as<br>ach during                                                                            |                                                             |
|                                                                                                                            |                                                                         |                                                                 |                                                                 |                                                                     |                                                                       |                                                                       |                                                                          |                                                                         |                                                          |                                                                              | ft (ooo's                                                                            | omitted).                                                                                                        |                                                             |
| B <vnbay<br>Bengal<br/>Madras<br/>Burma<br/>Sind</vnbay<br>                                                                | •                                                                       |                                                                 | -<br>-<br>-<br>-                                                |                                                                     | •                                                                     | :                                                                     | •                                                                        | •                                                                       | •                                                        |                                                                              | 108,516<br>3.780<br>1,132<br>20<br>3                                                 | 123,023<br>4,35i<br>1,493<br>38<br>I                                                                             |                                                             |

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| GOSSYPIU                                                                     | M.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Beview                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | of the In                                                                                                                                                                                                               | dian <b>Tra</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                         | •<br>                                                                                                                                                                                                                                                                                                                                               |
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| TRADE-<br>FOREIGN.<br>Ottiep Cotton<br>Manufac-<br>tures-<br>Imports.<br>271 | The a $Se^{\circ U}_{i}$<br>follows $\cdot^{\circ}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | of cott<br>of cott<br>of cott<br>of cott<br>manu/a<br>'' ^ 5 ^ [<br>manufactt<br>ghlessi &<br>mports dur<br>verages of i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TURES (EX<br>60n manuf<br>6° notwith<br>1°C <sup>T</sup> <sup>TM</sup> d clo<br>P°P <sup>ulati</sup> o<br>ures owin<br>* A gaa<br>1° S <sup>th</sup> P                                                                  | CLUDINC<br>actures si<br>instanding<br>oths. Ti<br>" Partly<br>g to the<br>ds o f Ma<br>ast twent<br>f Cotton                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | G TWIST<br>how on t<br>tow on t<br>tow on t<br>ts the yea<br>his is, pr<br>by the yea<br>the the<br>the ter<br>ty-five yea                                                                              | AND YARN.)— IM-<br>he whole a steady<br>rly augmentation<br>obablyfaccounted<br>radual ousting of<br>in popularity of<br>ars have been as<br>tures (excluding                                                                                                                                                                                       |
|                                                                              | 1866-67 to 1870-71<br>1871-72 to"i875-76<br>1876-77 to 1880-81<br>1881-82 to 1885-86<br>1886-87<br>1887-88<br>1888-89<br>1888-89<br>1888-89<br>1888-89<br>1888-89<br>1888-89<br>1887-88<br>1888-89<br>1888-89<br>1887-88<br>1888-89<br>1887-88<br>1888-89<br>1887-88<br>1888-89<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1887-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897-88<br>1897 | $f_{1}^{r} T^{g 0}$ $T^{r} W \ll Fr$ $f_{1}^{r} W \ll Fr$ $h^{r} \ll 2^{-f_{1}}$ $h^{r} \ll 2^{-f_{1}}$ $aS^{r} \ast 2^{r}$ | ods made<br>A/aconse<br>Ined *?<br>dothsa<br>rely aboli<br>the follow<br>U 'S ^ P<br>f with th<br>Inetrade<br>tho, gh Sti<br>S ^ '' ?<br>ases, to co<br>c i p a t e c<br>-ne Prim<br>ermanufact<br>*?<br>10 patio<br>?' | of 3° »<br>quence<br>revenue<br>lmost «*<br>shed all<br>vin* rema<br>robable t<br>e other d<br>of d other<br>of d other<br>of d other<br>s Possi<br>of d other<br>of d othe | it was e<br>of « lak<br>My ceas<br>duty on<br>ari mad<br>hat the te<br>luties on<br>to the olc<br>to the olc<br>to the old<br>o supply the<br>hirtings<br>ds that the<br>men it of<br>and of<br>men dur | stimated that in<br>hs of "&" a 1 g<br>sed. The Tariff<br>cotton manufac-<br>$e^{b} > the \land " \land$<br>otaf abolition of<br>general imports,<br>f descriptions of<br>demand having<br>OS yar, " ilm ay<br>hem. Generally<br>and cloths of. a<br>he partial remis-<br>32s. and 50s.<br>with sending the<br>s dual, with the<br>able article and |
|                                                                              | price in compariso<br>which, in many ca'<br>In the Review of T<br>remarked that a rev<br>so generally as h a<br>ANALYSIS OP II<br>under the heading<br>trade returns are f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | trade Lt^i<br>visionTotk<br>d^n antic<br>MPORTS I<br>of 5*£i!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <sup>A</sup> wT <sup>en</sup><br>fn^j <sup>9</sup> A* <sup>C</sup><br>CT''<br>Ma <sup>1nc</sup> , rea<br>Ma <sup>4</sup> , h <sup>*1</sup>                                                                              | and the second s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | as well, a<br>rch 1883<br><sup>seshad</sup> oc                                                                                                                                                          | t a lower price."<br>, Mr. O'Oonor<br>ccurred, but not<br>, j<br>items included<br>beriod forWhICh                                                                                                                                                                                                                                                  |

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|                                                | > r.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>A</b>   | 13,27,37,410                  | 16,43,02,131        | 4                | TRADE-<br>FOREIGN.<br>Other Cotton<br>Manufactures<br>—Imports. |
| ctures.                                        | ŏŠ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | at 1       | i                             | 1et+1e              | 8,63,333         |                                                                 |
| t Manufa                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ot .       | 3,94,923                      | i                   | M t              | f available s                                                   |
| 's of Cotton                                   | Thread<br>(sewing).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | рж.        | 4.39.449                      | in <b>66</b> 6      | 13,96            | Last year of available statistics.                              |
| sed under Imports of Cotton Manufactures.      | Hosiery,<br>pure and<br>mixed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | at         | :                             | ≡7, <b>176</b>      | 8,71,713         | **                                                              |
|                                                | C-"<br>BiJtJ<br>Agi4a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ¢          | :                             | <b>56</b><br>00     | 5,86,869         | : returas.                                                      |
| ticles –                                       | 0*&Q-S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Of         | 45,211                        | 31,169              | 1,51,044         | of complete                                                     |
| ક્રમાંગ્લક વર્ય                                | Handker-<br>chiefs and<br>shawls<br>in the<br>piece.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | et.        |                               | 9. tb. 754          | <b>21,</b> 801   | First year of complete returns.                                 |
| Tople shewing increase in the various articles | Piece-goods,<br>coloured,<br>printed, and<br>dyed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Ω <b>r</b> | 2,57,69,940                   | 2,83,75.∞           | 5,62,31,817      | +                                                               |
| waing incr                                     | <ul> <li>o ds, Piece-goods, <sup>1</sup></li> <li>white</li> <li>b (bleached). <sup>1</sup></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ΩĽ         | <sup>2</sup> ,4 <sup>10</sup> | 77,064              | <b>44,508</b>    | r of statistics.                                                |
| Table sh                                       | iec<br>99,99,69<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,000<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,00<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,000<br>10,0000<br>10,0000<br>10,0000<br>10,00000000 | <b>A</b> £ | 7,85,78,567                   | . 10,63,97,122      | 15,96,24,764     | It                                                              |
| •                                              | •<br>fid<br>>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            | 1866-678                      | 1875-76†            | G. 27            | /1                                                              |

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                                                                                                                                                                                                                                                            | Revie                                                                                                                                                                     | ew of                                                                                                                                                     | f the                                                                                                                                                                         | Indi                                                                                                                                                                     | an T                                                                                                                                                                                                | fad                                                                                                                                      | e in                                                                                                                                                                                                                                                                                                                  |                                                                                                |
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| TRADE-<br>FOREIGN.<br>Other Cotton<br>Manufac-<br>tures-<br>imports. | It will be seen that nearly every article shows a steady and fairly proportional increase, with the exception of canvas, the imports of which have markedly diminished in value.<br>The United Kingdom virtually possesses the monopoly of this exten, sive trade. Thus, in the year under consideration, imports to the value or $^{27*34,92,942}$ came from that source, leaving only 1*41,52,140 to be accounted for by other countries. Of this small amount, Italy supplied goods to the value of 1*9,44,910; Austria, R8,37,33i; the Straits Settlements, 1*7,25,928; the United States, £5,87,745; France, R5,33»^7; and uermany, R 1,83,561. Other countries supplied small amounts valuing less than one lakh.<br>In 1887-88, the amount derived from other countries than the Unitea Kingdom, showed a marked correspondence in value with that of 1888-89, amounting to R40,05,262. In that year, however, Austria suppli&l niucn the largest quantity, while the value of the imports from the United States valued R 1,41,134 only.<br>The shares taken in the imports, by each of the seaboard provinces, during the past two years were as follows:— |                                                                                                                                                                             |                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                           |                                                                                                                                                           |                                                                                                                                                                               |                                                                                                                                                                          |                                                                                                                                                                                                     |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                       |                                                                                                |
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|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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|                                                                      | Bengal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                            |                                                                                                                                          | 12,62,81,551                                                                                                                                                                                                                                                                                                          | 1454,77,039                                                                                    |
|                                                                      | Bombay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                            |                                                                                                                                          | 7,25,74,360                                                                                                                                                                                                                                                                                                           | 8,46,25,998                                                                                    |
|                                                                      | Madras                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                             | •                                                                                                                                                           | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                            |                                                                                                                                          | 1,80,58,165                                                                                                                                                                                                                                                                                                           | 2,17,01,711                                                                                    |
|                                                                      | Burma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                             | •                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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                                                                                                                            |                                                                                                                                          | 1,30,17,641                                                                                                                                                                                                                                                                                                           | 86,31,259                                                                                      |
| .                                                                    | Si/id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | •                                                                                                                                                                           | •                                                                                                                                                           | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                            | -                                                                                                                                        | 95,12,959                                                                                                                                                                                                                                                                                                             | 1,72,09,075                                                                                    |
|                                                                      | ceives<br>half of<br>The pe<br>the No<br>other h<br>colource<br>and co<br>latter i<br>RE<br>In 188<br>of R63<br>Ri7,io<br>Zanzil<br>Mozan<br>and R<br>were d<br>Ne<br>under<br>the wl<br>Madra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | near<br>the<br>eople<br>orth-<br>nand<br>ed cl<br>bloun<br>in th<br>C-EX<br>8-89<br>8,54,<br>,702<br>bar;<br>mbic<br>1,43<br>lespa<br>arly<br>con<br>hole.<br>as to<br>Fxno | ly tw<br>white<br>of I<br>-Wes<br>I, the<br>loths<br>red c<br>rese I<br>POF<br>they<br>523<br>2 to<br>R9,<br>100<br>5683<br>atche<br>sider<br>5683<br>atche | vo-thi<br>e good<br>Benggat Pro-<br>peological Pro-<br>peological Pro-<br>peological<br>peological<br>entities<br>attoon<br>d to<br>entities<br>attoon<br>entities<br>attoon<br>entities<br>attoon<br>Pro-<br>peological<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entities<br>entitties<br>entities<br>entities<br>entitie | irds o<br>ods, a<br>al pr<br>ovince<br>ple of<br>e Bu<br>to tl<br>nces<br>—Th<br>ounte<br>to<br>key<br>29 to<br>6,588<br>[atal.<br>other<br>re tr<br>, exp<br>and<br>e of | of the<br>ind a<br>oper<br>ces de<br>f Wes<br>rmes<br>have<br>e re-<br>d to<br>Pers<br>in A<br>S to 0<br>. Sn<br>r cou<br>ade<br>porte<br>l Sin<br>1   la | e imj<br>still<br>and<br>o not<br>stern<br>e tak<br>ropor<br>latel<br>expor<br>only<br>ia; I<br>Asia;<br>auriti<br>Ceylo<br>nallen<br>ntrie<br>is co<br>d go<br>d ex<br>kh, a | porte<br>small<br>of As<br>t wea<br>a and<br>e a co<br>tion<br>y beo<br>ts by<br>81,7(<br>R 19,<br>Ris<br>us;<br>Dn; R<br>c qua<br>s.<br>nfine<br>ods t<br>porte<br>nd B | d gro<br>ler pi<br>ssam<br>ar co<br>Sour<br>ompa<br>of gr<br>ompa<br>of gr<br>en in<br>y sea<br>0,51,6<br>46,86<br>5,95,4<br>R9,8<br>X 1,72<br>antition<br>d to<br>co the<br>d to<br>co the<br>d to | ey §<br>copo<br>and<br>loun<br>ther<br>urati<br>cey,<br>ccrea<br>are<br>574,<br>51 t<br>418<br>2,522<br>864<br>E0<br>e va<br>the<br>a an | goods, it importion of the co<br>ortion of the co<br>d the bulk of<br>red clothing,<br>in India are<br>ively large qua<br>though the in<br>asing.<br>comparatively<br>of which good<br>to the Straits<br>to Arabia;<br>7 to Aden;<br>to Makran a<br>valuing less the<br>ombay, which<br>alue of R 1,63<br>e amount of | nd Śońmiani;<br>han one lakh,<br>, in the year<br>3,31,313 <sup>out</sup> ?*<br>2J lakhs each, |

Cotton and Cotton Manufactures. (Watt & Murray.) GOSSYPIUM.

EXPORTS.—The exports of all Indian cotton manufactures, exclusive of twist and yarns, in the year under consideration, valued 81,16,74,640. This amount was made up as follows :—

| NATURE OF GOODS.                                                                                                                                                                                                                                        | ft                          | Yards.                                                                            | R                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| I.—Piece-goods—<br>1. Grey (unbleached)<br>2. White (bleached)<br>3. Coloured, printed, or dyed .<br>4. Handkerchiefs and shawls in the<br>piece.<br>5. Other sorts of piece-goods .<br>)»—Hosiery, pure and mixed<br>{11.—Thread, sewing<br>Ij.—Canvas | <br><br>50,739<br>1,851,855 | 54,938,813<br>n6,355<br>15*189,059<br>1,073,077<br>21,122<br><br><b>1,856</b><br> | 64,66,979<br>46,504<br>43^8,741<br>5*23,515<br>15,888<br>19,036<br>39-732<br>833<br>2,43,412<br>1,16,74,640 |

The trade has been rapidly progressive within the last twenty years, as might naturally be expected from the increase in the number of mills. Thus, in the quinquennial period ending 1875-76, the value amounted to R34,99J927; in that ending 1880-81 to R51,12,644; in the five years ending 1885-86 to 882,14,879; in 1886-87 to  $894,56,437^*$  <sup>in</sup> 1887-88 to R 1,15,05,419 £and in 1888-89 to 81,116,74,640. Substantial as the progress has been, it is far short of the advance made in the export of yarns. Mr. O'Conor remarks on this point: "As long as the Chinese and Japanese maintain their preference for weaving their cloths themselves from imported yarn, instead of importing it ready-made, the export of our yarns must necessarily augment much faster than that of piece-goods."

The chief importers in the past year were:—Aden, with a total amounting in value to 820,61,942; China with 819,93,595; the Straits Settlements with Ri7>37»944; Ceylon with 816,99,511; Zanzibar with 811,79,446; Mozambique with 88,37,220; the United Kingdom with 86,19,520; Arabia with R5><sup>2</sup>7»<sup>2</sup>o2; Persia with 83,19,792; Turkey in Asia with 82,49,714; Mekran and Sonmiani with 81,35,9715 and Abyssinia with 81,13,104. Several other countries imported smaller quantities valuing less than one lakh of rupees.

The exports were distributed as follows, among the seaboard presidencies and provinces, during the last two years:—

| <u> </u>                                       |   | <u> </u> |                     |             |             |   | 1887-88.                                                   | 1888-89.                                                   |
|------------------------------------------------|---|----------|---------------------|-------------|-------------|---|------------------------------------------------------------|------------------------------------------------------------|
| Bombay<br>Madras<br>Bengal<br>Siyd.<br>Burma • | • | •        | <br><br>•<br>•<br>• | •<br>•<br>• | •<br>•<br>• | • | 8<br>69,68,896<br>42,22,203<br>1,69,443<br>i,44>334<br>543 | R<br>75.47»780<br>38»54,49i<br>1,41*403<br>1,30,562<br>404 |

Bombay thus possesses more than 64 per cent, of the trade in woven goods. It should be mentioned, however, that a considerable proportion of the exports from Madras consists of cloths dyed in that presidency, the pieces having been woven in Madras, in Bombay, or in England—that, in fact, Bombay is the centre of cotton-spinning and weaving 'industry in India.

tures -Exports.

| GRACILARI                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| lichenoide                                                           | S. The Agar-agar or Ceylon Moss.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TRADE-<br>FOREIGN.<br>Other Cotton<br>Manufac-<br>tures-<br>Exports, | (See <i>Trade Review for 1888-89.)</i> The following remarks from Mr. Beaufort's <i>Indian Cotton Statistics</i> regarding the progress made by, and the distribution of, the chief cotton manufactures of Bombay may, therefore, or of interest :- "The demand for T. cloths and Sheetings, especially in the past three years, has increased considerably. Longcloths, too, have been in more favour in the past two years, but Domestics show no expansion, "Drills' and * Jeans * have fallen off largely. * Dhoties' and 'Shudders' find but few buyers out of the country, but the total trade in the last three years has been growing. The increase in T. cloth is purely to China, the largest consumer of this description of cloth, Mozambique and Zanzibar oping the next largest buyers. Of • Sheetings' Zanzibar takes nearly halt the exports, Mozambique being the next important outlet. * Longcloths '.go* ** a rule, principally to Aden, for re-export; but last year China tookjjie leaa* whereas but two years ago her takings were so small as to be included, under ' other ports.' Aden takes nearly all the • Domestics.'"                                                                                                                                                                         |
|                                                                      | GRACILARIA, Grev. ; Agardh., Sp. Alg., IL, 584.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                      | A genus which comprises from 20 to 30 species, natives of the warmer<br>seas of various parts of the world, and characterised, as its name implies,<br>by the sleiiderness of its filaments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 272                                                                  | <b>Gradlaria confervoides,</b> <i>Greville, Algae Britann</i> <sup>54</sup> ; ALGJE.<br><b>Syn.</b> —Fucus ECHELIS, <i>Gmel.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 273                                                                  | G. lichenoides, Greville, Alga, Britann., \$4; Turner, Fuel, /: 118.<br>Syn.—Fucus AMYLACEUS, O*Sh.; F. LICHENOIDES, Linn.; F. GRLATINO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| MEDICINE.<br>Sea-weeds.<br><b>274</b>                                | sus, Koeing; SPH-ROCOCCUS LICHENOIDES, Agardh (not < f Grev.);<br>PLOCARIA CANDIDA, Nees.<br>These two species constitute the commercial product known as ~~ this<br>Moss, JAFFNA MOSS or AGAR AGAR, and may, for the purposes ot<br>Y^ok, be considered conjointly.<br>Vein.—Chinai-ghds, BOMB.; Ddrya-ki-pdchi, DEC. JKadal-pdch-chi, TAM.;<br>Samudrapu-pdchi, TEL./ Kujdv-pcen, BURM.<br>References.—Pereira's Mat. Med., II.9 Pt. I., 14; Pharm. Interaction<br>465; O'Skaughnessy, Beng. Dispens., 668; Moodeen Sheriff, Supf Hanb.,<br>Ind., 150; Dymock, Mat. Med., W. Ind.,2nded., 872; Fluck. & and<br>Pharmacog.,7491 Bent, & Trim., Med. PL, 306; Mason, Burma<br>Its People, 507, 832; Balfour, Cyclop., I., 1154, ****<br>Habitat-Found on the coasts of the Indian Ocean, especially in<br>Ceylon; extending to Burma, and the Malay Archipelago.<br>Medicine.—The dried SEA-WEEDS have long been employed as a meai-<br>cine in the localities in which they occur, and form an article of some<br>considerable trade with China. The plants are chiefly collected during<br>the south-west monsoon, when they become separated by the agitation<br>of the water, and thrown or shore. They are dried in the sun, on mats, ior<br>two or three days, then washed several times in fresh water, and again ex_ |
| Compositi or<br><b>275</b>                                           | posed to the sun. By this means they are bleached, and become nt ior<br>use, or for exportation.<br>Ceylon moss is considered by the natives of Southern India and ueyion<br>to be nutritive, emollient, demulcent, and alterative, and especially valu-<br>able in pectoral affections. It has been described by many learned writers,<br>and was for the first time submitted to a careful chemical examination oy.<br>OShaughnessy. It has obtained a place amongstitue officinal drugs 01<br>the Indian Pharmacopooia, but though occasionally employed in Europe<br>and America, it is neither officinal in the Pharmacopoeia of Great Britain,<br>nor in the U.S. Dispensatory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| The Cevion Moss. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ANGEA                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| mader                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <u>aspatana.</u>                      |
| length and varying in thickness from the size of a crowquill to that <sup>o</sup> f ordinary thread. It has a feebly saline taste, a flavour of sea-weed, and <sup>a</sup> cartilagenous consistence.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MEDICINE.                             |
| CHEMICAL CHARACTER.—Ceylon moss as examined by O'Shaugh-<br>nessy yielded :—vegetable jelly 54'5 P? <sup>r</sup> c <sup>ent</sup> ? starch 15 per cent., cellu-<br>lose 18 per cent., gum 4. per cent., and inorganic salts 7'5 per cent. The<br>authors of the <i>Pharmacographia</i> write: '* Some chemists have regarded<br>the jelly extracted by boiling water as identical with pectin, but this state-<br>ment requires proof. Payne called it <i>gelose</i> , and found it composed of<br>carbon 4277, hydrozen 5*77, and oxygen 51*45 per cent," The salts<br>according to O'Shaughnessy consist of sulphates, phosphates, and chlo-<br>rides, with neither bromide nor iodide.                         | Chemistry.<br>276                     |
| M«DICAL PROPERTIES AND USES.—In its properties it resembles Carra-<br>gern moss, being emollient, demulcent, and nutritive. It may be used in<br>the form of a decoction or jelly, as a light and readily digestible food for<br>invalids and children, as an emollient in intestinal catarrh and irritation,<br>and as a demulcent in pulmonary complaints and irritation of the throat.<br>The jell or decoction may be made more palatable by the addition of<br>milk, w" e or aromatics.                                                                                                                                                                                                                      | Properties<br>and Uses.<br><b>277</b> |
| Foot —In the Indian Archipelago and China large quantities are<br>employed in place of isinglass for the preparation of jellies, and, as already<br>stated, considerable quantities are exported from India to China.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FOOD. <b>278</b>                      |
| Industrial Uses. —Occasionally employed in England as a jelly for dressing silk.<br>Grains, see Cereals, Vol. II., 257,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | INDUSTRIAL:<br>USES.<br><b>279</b>    |
| <i>Maton);</i> Vol. III., 227.<br>Gram, see Cicer arietinum, <i>Linn.</i> , Vol. II., 274.<br>Gram, Horse, see Dolichos biflorus, <i>Linn.</i> , Vol. III., 175.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |
| <b>GRANGEA,</b> Adam., Gen. PL, II., 261.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |
| <ul> <li>Grangea maderaspatana, Poir., Fl. Br. Ind., III., 247; Wight,<br/>\Jc. /., 1097 * COMPOSITE.</li> <li>Syn.—ARTEMISIA MADERASPATANA, Roxb, COTULA MADERASPATANA,<br/>Willd.; C. SPHiERANTHUS, Link.; GRANGEA SPHiERANTHUS, Koch.</li> <li>Vern —Mustari, HIND.; Namuti, BENG.; Mashipatri, TAM.; Savt, TEL.j<br/>Dovana, KAN.; Nelam-pata<sub>t</sub> nelampala, MALAY.; Wai kolondu, SING.;<br/>Afsantin, ARAB.; Baranfdsif kowki, PERS.</li> <li>References.—Roxb., Fl. Ind.<sub>t</sub> Ed. C.B.C., too; Dale. &amp; Gibs., Bomb.<br/>Fl., 124; Ainslie, Mat. Ind.<sub>t</sub> I., 481; Dymock, Mat. Med. W. Ind., 2nd<br/>Ed., 434; S. Arjun, Bomb. Drugs, 78; Murray, PL_and Drugs, Sind,</li> </ul> | 280                                   |
| 182; Atkinson, Him. Dist., 3ii; Gazetteers.—-ft <sup>r</sup> W\ P., I.,8ifl <sup>V</sup> .,<br>Ixxiii; Bomb., XV. <sub>f</sub> 436.<br>Habitat.—A common weed found throughout India, from the Panjab<br>eastwards and southwards. Distributed through Tropical and Sub-tropical                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |
| Asia and Africa.<br><b>Medicine.</b> —The medicinal properties of this plant were first brought<br>to the notice of Europeans by Ainslie, who wrote: "The Tamool doctors<br>consider its LEAVES to be a valuable stomachic medicine; they also<br>suppose them to have deobstruent and antispasmodic properties, and<br>prescribe them in infusion and electuary in cases of obstructed menses<br>and hysteria; they sometimes, too, use them in preparing antiseptic and<br>anodyne fomentations." Apparently they are similarly employed to the<br>present day, and are especially valued for their anodyne properties.                                                                                         | 281                                   |
| G. 281                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |

| · · · | <b>Special Opinion.</b> —§ The juice of the leaves is employed as an instilla-<br>tion for earache. (Honorary Surgeon P. Kinsley, Chicacole, Ganjatn,<br>Madras.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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|       | Madras.)<br>GRANITE, Ball, in Man. Geology of India, III., S34-<br>The following note has been kindly furnished by Mr. H. B. Medlicott,<br>late Director of the Geological Survey.<br>ranite, Eng.; GRANITE,/V.; GRANIT, Ger.; GRANITO, ItaU<br>Granite has as yet, economically considered, been only specialised as<br>such in European countries and their off-shoots, and even there in many<br>cases, the rock is not in reality a granite but some form of massive<br>crystalline igneous or metamorphic rock. In India the term is evpn more<br>general, and all crystalline rocks, as long as they are tolerably compact,<br>granular, crystalline igneous rock might be set down as of universal occur-<br>rence in India; except in the Bombay Presidency and the Deccan, or in<br>the flat alluvial districts. Keeping, however, to the proper idea of<br>granite, that is, a crystalline igneous rock principally composed of quartz,<br>felspar, and mica, either as a ternary compound of these minerals or as a<br>binary compound of two of them, the occurrence of the rock becomes,<br>for industrial purposes, very restricted. Without running the distinc-<br>tion too close, it may be well, on the economic view, to notice localifies-<br>for stone which, for all practical purposes, and without infringing very<br>much on the geological definition of the term, may be considered granite.<br>With this proviso, the rock can be expected to occur only in the areas of<br>crystalline rocks, which are, <i>par excellence</i> , the Himalayan region, in and<br>the southern and eastern tracts of Peninsular India. In the Himatayan<br>district the distinction of granite from gnesis is still a vexed question, but<br>t'ere seems to be no doubt that the rock occurs in the Central Hima-<br>laya in what is called the granitic axis of these mountains. To the<br>east in Sikkim, and in the north-west, from the frontier of Nepal to KuUt<br>wherever examined, coarse white granite has been found in profusion<br>along the line of peaks, near the present edge of the sedimentary basin<br>of Tibet. It occurs in veins and dykes of every size, s |

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Products of India.

| Gradite: Grewia. (J. Marray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Grinver<br>Renation |
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| and Salem districts, in the low country, especially in the Sunkerry Drug                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | GRANTE.             |
| but there is no introded granite mass of large dimensions. A strong band                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| A very passed was in a second to the fighter of the fighter of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| north or left hank of the Coursey river in South Arco. to the east of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| the Salem hill answer a considerable area is occurred by focks hill and the sale of the sa |                     |
| Very granitic senect In the eastern nortions of the Bellary district, apout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| Listi - and again in Dheep of the Karnil district an exceptionally compare                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| close grote all finds and whitigh rock accurs, which may be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| considered granite. In the Nellore district, about Mour <del>, a very cuarse</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| and typical genoits accurs in torce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -                   |
| Among the gneissic rocks of Burma veins of granite are common, our                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| little is known of them in detail.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |
| All these granites with perhaps, the exception of the limitation forms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| appear to be worked only to a small extent, and to be exclusively used for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| Sest <sup>^</sup> mcposes: but there is no doubt that in certain places they were the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <ul> <li>Lavourite stone for the more ancient temple buildings, especially in the way</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2                   |
| of monolithic structures. <u>Even in the future it is questionable whether they</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7                   |
| will come into greater demand, as long as the easief-worked gnoisses with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| which they are associated, can be obtained close at hand. For further                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| economic information see STONES, BUILDING, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Grapes, see Vitis vinifers, Linn. ; AMPELIDER ; also List of Indian Fruits,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
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| Graphite, see Plumbago, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| Grass, see Lists of Fodder, Vol. III. 420-427 and 432-37-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |
| Grass-cloth-A name given to the woven fibre of Bullmeria nives, Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| The second secon |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| Grass mats, see Mats and Matting, Vol. V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -                   |
| Grass oil-Obtained from species of Andropogon (see Vol. 1, 21-252).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Green or American Hellebore, see Verstrum viride, Aiton ; LILIACE.R.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ,                   |
| Green-stone, see Trap, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |
| GREWIA, Linn.; Gen. Pl., 1., 233.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <u> </u>            |
| A genus of shrubs or small trees belonging to the Natural Order Frances,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| and comprising about 60 species, for the most part confined to the hotter<br>regions of the Old World. Of these 36 are natives of India. Most of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| TO THE AND AN AND THE TO THE AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| species derive economic importance from the fact that their inner back one                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |
| species derive economic importance from the fact that their laser bark con-<br>tains a valuable fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| apecies derive economic importance from the fact that their inner bark con-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| Grewia asiatica, Linn.; F! Br. Ind., / - O.C FLIACEZ.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 282                 |
| Grewia asiatica, Linn.; Fl Br. Ind., / ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |
| Grewia asiatica, Linn.; Fl Br. Ind.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 283                 |
| Grewia asiatica, Linn.; F! Br. Ind., ^                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| Grewia asiatica, Linn.; Fl Br. Ind., ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |
| Species derive economic importance from the fact that their inner bark con-<br>tains a valuable fibre:     Grewia asiatica, Linn.; Fl Br. Ind., * **********************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Species derive economic importance from the fact that their inner bark con-<br>tains a valuable fibre.<br>Grewia asiatica, Linn.; F! Br. Ind., * **********************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |
| Species derive economic importance from the fact that their inner bark con-<br>tains a valuable fibre:     Grewia asiatica, Linn.; F! Br. Ind., * **********************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Species derive economic importance from the fact that their inner bark con-<br>tains a valuable fibre.<br>Grewia asiatica, Linn.; F! Br. Ind., * ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Species derive economic importance from the fact that their inner bark con-<br>tains a valuable fibre.<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ LLACER.,<br>Syn.—Grewia subinæquatis, DC.<br>It is convenient, for economic purposes, to consider our, vestita, Wull.,<br>separately.<br>Vern. ~ Pharsé, phalsé, phulsé, pharoah, shukri, HIND.; Phoisé, shukri,<br>BENG.; Singhindamin, Kot.; Jang viat, SANTAL; Fussi, Newari;<br>Fursu, fulsa, PARRUT; Phalso, pharsiya, dháman, NW.P., Phálsa,<br>P., 1 Pastaoni, shikarim-ai-wah, PUBRTU; Dhamni, Ajura; Phálsa,<br>phatea, SIND; Dhamru, dhomm, C. P.; Phálsat, Boubs, Phálsi,<br>MAR,; Phalsé, GUZ.; Phulsha, pulsha, DEC.; Taddeki, T.M., Putur,<br>phutiki, Tel.; Domaniya, SING; PORsha, SANS; Edlach, Pupes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| Species derive economic miportalica from the fact that their innar bark con-<br>tains a valuable fibre:<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| Species derive economic miportalica from the fact that their inner bark con-<br>tains a valuable fibre:<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| Species derive economic miportalica from the fact that their inner bark con-<br>tains a valuable fibre:<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| Species derive economic miportalica from the fact that their inner bark con-<br>tains a valuable fibre:<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| Species derive economic miportalica from the fact that their innar bark con-<br>tains a valuable fibre:<br>Grewia asiatica, Linn.; Fl Br. Ind., ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |

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| GREWIA                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| -excelsa-                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FIBRE.<br>Bark.<br>2&L<br>MEDICINE.<br>Fruit.<br>285<br>Leaf.<br>286<br>Bud.<br>287<br>Bark.<br>288<br>Root.bark.<br>289<br>FOOD.<br>Berry.<br>290<br>TIMBER.<br>2QI<br>INDUSTRIAL | <ul> <li>65; Irvine, Mat Med. of Patna, 88; Atkinson, Him. Dist., 738 702;<br/>Ec.Prodt, NW. P., Pt VV. 48(8,Lisboa, U. PL, Bomb., 27, Ird., 30);<br/>Bivdwood, Bbomb. Ppr., T40, jgr, 20200;HrbovLourour *** *** Series),<br/>Agri-Hort. Soc. Ind., Transactions, IV., 103; Journal (Old<br/>II., Set. 216; IX., Sel., 40; Cross, Bevan &amp; King, Indian Fibres, 39,<br/>Balfunc, Cyclop., I., 1253; Kew Off. Guide to the Mus. of Ec.Boty*,<br/>Indian Forestir, III., 200; VIII.,4*7, 418; XII., App.8; MadraSettat<br/>of Administration, I., 313; District ManualsCoimbatore, 4*&gt;W</li> <li>mentReport, Lahore, 12; Gazetteers:Panjdb, Peshawar, 27; "1;*</li> <li>I. 79; IV., Ixix; X., 306; Mysore and Coorg, I., 5\$; Bombay, K., *foo<br/>HabitatA small hazel-like tree, cultivated throughout India; saidrs<br/>be indigenous in the Salt-Range, Poona, Oudh, and Ceylon. j - ""</li> <li>Babter, it is much employed in rope-making.<br/>Medicine—The FRUIT, which is one of the <i>phala-traya</i>, or ".it-triad<br/>stoma-<br/>of Sanskrit writers, is supposed to possess astringent, cooling, and sherbet<br/>chic properties. A spirit is distilled from it, and a pleasant<br/>prepared by mixing it with sugar. The LEAF is employed as an applica-<br/>tion to pustular eruptions, and the BUD is also prescribed by native P<sup>ra</sup>r"<br/>titioners. An infusion of the EARK is used as a demulcent. The rte<sup>*</sup> A<br/>Campbell states that the ROOT-BARK is employed by the Santals as<br/>remedy for rheumatism.</li> <li>Food.—The small dark purple BERRY is much esteemed by Natives<br/>as a pleasant, acid fruit. As already stated, a <i>sherbet</i> and spirit are pre-<br/>pared from it in many parts of the country.</li> <li>Structure of the Wood.—Yellowish-white, close-grained, strong ana<br/>elastic, similar to that of var. vestita, and according to the Rev. A. A'' V*''<br/>bell, much prized in Chutia Nagpur, for making banghy-poles, ana 10<br/>other purposes for which combined lightness and strength are desired.</li> <li>Industrial Use.—The mucilaginous JUICE of the bark is used in bana-<br/>wan pur for clarifying sugar. (Liotard; Atkinson.)</li> </ul> |
| JSE.<br>Juice*                                                                                                                                                                     | Grewia asiatica, var. vestita, Wall. / Fl. Br. Ind., I., 387.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 292                                                                                                                                                                                | Syn.—GREWIA ELASTICA, Royle.; G. ASIATICA (in part) and G. OBIECTA,<br>Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 293                                                                                                                                                                                | <ul> <li>Wall.</li> <li>V'em.—Pharsia, dhamun, <sup>6</sup> bimla, dhamdni, HIND.; Dhamdni, BBNG; Olat, SANTAL; Sealposra, NEPAL; Kunsting, LEPCHA; Perskuajelak, MICHI; Dhdman, NW. P.; Farri, phalwd, dhamdn, PB.; Dhamun, C. P.; Potodhamun, PALAMOW 3 Pint ay an, pintayo, pengtarow, BURM.; Dharmana, dkanvana, SANS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                    | References.—Brandis, For. Fl., 40; Kurz, For. Fl. Burm., I., 160; Gam-<br>ble, Man. Timb., 55; Stewart, Pb. PL, 27; Rev. A. Campbell, Ec. Prod.,<br>Chutia Nagpur, No. 8790; U. C. Dutt, Mat. Med. Hind., 296; Baden<br>Powell, Pb. Pr., 58r; Ind. Forester, IV., 321; IX., 254, 274; XII., 64;<br>XIV., 302; Gazetteers:—Panjdb, Simla, 11; Gurdaspur, 70; NW.<br>P., X., 306: Settlement Reports'.—Central Provs., Bhundara Dist.,<br>19; Seonee Dist., 10.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| FOOD.                                                                                                                                                                              | Habitat.—Met with in the Sub-Himålayan tract, Bengal, Central India,<br>and Burma.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Ernit.<br><b>204</b>                                                                                                                                                               | Food and Fodder.—The BRANCHES are lopped for fodder. The "RUIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| FODDER.                                                                                                                                                                            | is eaten.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Branches.<br>295<br>TIMBER.<br>206                                                                                                                                                 | Structure Of the Wood.—Tough and elastic, weight from 43 to 511b<br>per cubic foot. It is used for shoulder poles, bows, spear handles, &c,<br>and as it splits well, is also employed to make shingles.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 296<br>297                                                                                                                                                                         | <b>G. excelsa</b> , Vahl.; Fl. Br. Ind., /., 385.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 231                                                                                                                                                                                | SynGREWIA ROTHII, DC; G. SALVIFOLIA, Roxb.; G. BICOLOR, Roth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                    | G. 297                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                    | · •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| <ul> <li>Vern.—Kulo, URIYA; Bathar, nikki bekkar, garges, PB.; Putiki, I<br/>Sirijana, TEL.</li> <li>References.—Roxb., Fl.Ind., Ed. C.B.C., fii;Brandts, For.Fl.,43;<br/>For. Fl. Burm., I., 160; Stewart, Pb. PL, 27; Baden Powell, P<br/>582; Balfour, Cyclop., I., 1253; NW. P. Gag., I., 79; Ind. Fe<br/>III., 200.</li> <li>Habitat.—A shrub of East Bengal, Assam, and the Coromandel;<br/>also in Sikkim and Bandelkhand. Distributed to Tropical Africa.<br/>Food.—This shrub flowers in the hot season, and its fruit ripens<br/>months later. The DRUPE is small, agreeable to the taste, and is<br/>by the natives.</li> <li>Grewia tevigata, Vahl.; Fl. Br. Ind., /., 389.</li> <li>Syn.—GREWIA DIDYMA, Roxb.; G. DISPERMA, Rottl.; G. MOLLO<br/>Ham.; G. LALPETA, Han.; G. OVALIFOLIA, JUSS.</li> <li>Vein.—Kat bhewal, bhimul, NW. P.5 Kaki, OUDH; Alii payaru,<br/>Kaori, karkisellimara, KAN.; Gulgollop, KONKANI.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 432; Brandis, For. F<br/>Kure, For. Fl. Burm., I., 159; Elliot, Flora Andhrica, i3; Gazett<br/>Bomb., XV.% 70, 428; NW. P., IV., 69; X., 306; Indian Forest<br/>200.</li> <li>Habitat.—A small evergreen tree, native of the Eastern Himalay<br/>Khrfsia Hills, Southern India, and Burma. Distributed to Tropical A<br/>the Malay Islands, and Australia.</li> <li>Fibre.—In the Bombay Gazetteer, Vol. XV. (Kandra), it is state<br/>this tree yields a favourite fibre, a remark confirmed by a private<br/>munication fiom W. A. Talbot, Esq., Conservator of Foreşts in the</li> </ul>                                                                             | kolupu,<br>; Kure,<br>b. Pr.,<br>orester,<br>; found<br>s a few<br>s eaten<br>DCOCCA,<br>t, TEL.;<br>FL, 42 f<br>teers:—<br>ter, III.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | POOD.<br>Drupe.<br>298<br>299                         |
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| <ul> <li>Sirijana, TEL.</li> <li>References.—Roxb., Fl.Ind., Ed. C.B.C., fü;Brandts, For.Fl.43;<br/>For. Fl. Burm., I., 160; Stewart, Pb. PL, 27; Baden Powell, P<br/>582; Balfour, Cyclop., I., 1253; NW. P. Gag., I., 79; Ind. Fe<br/>III., 200.</li> <li>Habitat.—A shrub of East Bengal, Assam, and the Coromandel;<br/>also in Sikkim and Bandelkhand. Distributed to Tropical Africa.</li> <li>Food.—This shrub flowers in the hot season, and its fruit ripens<br/>months later. The DRUPE is small, agreeable to the taste, and is<br/>by the natives.</li> <li>Grewia tevigata, Vahl.; Fl. Br. Ind., /., 389.</li> <li>Syn.—GREWIA DIDYMA, Roxb.; G. DISPERMA, Rottl.; G. MOLLO<br/>Ham.; G. LALPETA, Ham.; G. OVALIFOLIA, JUSS.</li> <li>Vein.—Kat bhewal, bhimul, NW. P.5 Kaki, OUDH; Alii payaru,<br/>Kaori, karkisellimara, KAN.; Gulgollop, KONKANI.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 432; Brandis, For. F<br/>Kure, For. Fl. Burm., I., 159; Elliot, Flora Andhrica, i3; Gazett<br/>Bomb., XV.% 70, 428; NW. P., IV., 69; X., 306; Indian Forest<br/>200.</li> <li>Habitat.—A small evergreen tree, native of the Eastern Himalay<br/>Khrfsia Hills, Southern India, and Burma. Distributed to Tropical A<br/>the Malay Islands, and Australia.</li> <li>Fibre.—In the Bombay Gazetteer, Vol. XV. (Kandra), it is state<br/>this tree yields a favourite fibre, a remark confirmed by a private</li> </ul>                                                                                                                                                                                                                    | ; Kure,<br>Pb. Pr.,<br>orester,<br>; found<br>s a few<br>s eaten<br>DCOCCCA,<br>t, TEL.;<br>FL, 42 f<br>teers:—<br>ter, III.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Drupe.<br>298                                         |
| <ul> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 432; Brandis, For. F<br/>Kure, For. Fl. Burm., I., 159; Elliot, Flora Andhrica, i3; Gazett<br/>Bomb., XV., 70, 428; NW. P., IV., 69; X., 306; Indian Forest<br/>200.</li> <li>Habitat.—A small evergreen tree, native of the Eastern Himalay<br/>Khrfsia Hills, Southern India, and Burma. Distributed to Tropical A<br/>the Malay Islands, and Australia.<br/>Fibre.—In the Bombay Gazetteer, Vol. XV. (Kandra), it is state<br/>this tree yields a favourite fibre, a remark confirmed by a private</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | teers:—<br>ter, III.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                       |
| district, who writes, •' a fibre often used for cordage in Kanara.''<br>Structure of the Wood.—Rather heavy, fibrous, but close grained                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Africa,<br>ed that<br>e com-<br>e same                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FIBRE.<br>300<br>TIMBER.                              |
| white, turning yellowish, then brownish. (Kurs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | + 22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 301                                                   |
| <ul> <li>G. Microcos, Linn.; Fl. Br. bid., I., 392; Wight, Ic, t. 84; III,<br/>Syn.—GREWIA ULMIFOLIA, Roxb.; G. AFFINIS, Lindl; G. BEGON<br/>Wall.; G. GLABRA, Jack; MICROCOS PANICULATA, L.; M. MALA<br/>M. STAUNTONIANA, G. Don.</li> <li>Var. rugosa (distinguished by its bullate leaves), G. RUGOSA, Wall.<br/>Vern.—Shiral, ansale, BOMB.; My a za, B URM.</li> <li>References.—Roxb., FL Ind., Ed., C.B.C., dSdH&amp;urs, For. FL Bu<br/>157; Thwaites, En. Ceylon PL, 32; Dalz. &amp; Gibs., Bomb. FL, 26; J.<br/>Hort. Malabo I., t. 56; Lisboa, U. PL Bomb., 147', 230; Bomb<br/>XV., 428.</li> <li>Habitat.—A very variable tree, generally from 40 to 50 feet in 1<br/>native of Eastern Bengal, the Khásia Mountains, Chittagong, Burm<br/>Western India. In the Khásia Mountains it ascends to 4,000 feet.<br/>ers in the rains, and the fruit ripens during the cold season.</li> <li>Fibre.—Beyond the fact that Lisboa includes this species in his<br/>fibrous plants, no record of its fibre exists.</li> <li>Food.—The DRUPE, of the size of a gooseberry, is eaten by Na<br/>especially during times of scarcity.</li> <li>G. multiflora, fuss. / Fl. Br. Ind., I., 388.</li> <li>Syn.—GREWIA SEPIARIA, Roxb.; G. SERRULATA, DC; G. COR<br/>Garcke.</li> <li>Vern.—Pansaura, HIND., BENG.; Nifay, NEPAL.</li> <li>References.— Roxb., FL Ind., Ed. C.B.C., 432; Brandis, For. FL<br/>Gamble, Man. Timb., 55.</li> <li>Habitat.—A shrub or small tree of Eastern Bengal, Assam, the S<br/>Himalaya, the Khasia Mountains, and the Nilghiri Hills, ascend<br/>4,000 feet. Distributed through the Malay Archipelago and East Tr</li> </ul> | NIFC IA,<br><i>ttam. /</i><br><i>urm., I.,</i><br><i>Rheede,</i><br><i>Gag.,</i><br>height,<br>ha, and<br>Flow-<br>list of<br><i>list of</i><br><i>list of</i> | 302<br>FIBRE.<br>303<br>FOOD.<br>Drupe.<br>304<br>305 |

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G. 305

| <b>GREWIA</b><br>oppositifoli                             | a Dhámanor `                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| TIMBER.<br>300<br>AGRICUL-<br>TURAL USE,<br>Plant.<br>307 | Structure of the Wood.—White, soft, similar in structure to that of Grewia oppositifolia, weight 42ft per cubic foot. (Gamble).<br>Agricultural Use.—This PLANT is extensively employed in Bengal tor making hedges, for which its close growth and evergreen leaves render 11 specially suitable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 308                                                       | Grewia oppositifolia, Roxb.; Fl. Br. Ind., I., 384; Wight, Ic., 1. 82.<br>Vern. — Biśl, biśng, bakśl, bhimal, bhengal, HIND.; Biśl, biśng, bewal,<br>oanuc, oemai, onimat, onengui, INw. tr.; unamnu, anamun, v*n***,«,<br>KUMAON; Dkdman, dhdmun, thuman, pharwa, bhewal, bhenwat.ohinw*<br>bahul, biul, PB.; Pastuwanne, pastawanai, pastaisana, PUSHTU,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| DYE.<br>Leaves.<br><b>309</b>                             | <ul> <li>Thidsal, KAN.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C, 430; Brandts, For. Fl., tf; GkkU' ble, Man. Timb., 54; Stewart, Pb. PL, 27; Baden Powell, Pb'/-&gt; 5f &gt; 582; Atkinson, Him. Dist., 306, 792; Drury, U. Pl., 235; Wdrdle, vy*. Rep., Sec. 32; Note by W. Coldstream, Esq., C.S., Dep. Com.*Strnia, Cross, Bevan &amp; King, Rep. on Indian Fibres, 9, 39; Balfour, Cyctop., /., 1253; Indian Forester, I., 384; IV., 389; Kill., 5*/ AgriHort. Soc. of India, Transactions, VIII, 260, 274,277; Journals (Old Sertep), X., Pro., 91, 108; Settlement Reports —Hasara, it; Kohat, 30 Parapp. II., xliii; Kangra, 22; Gazetteers '.—Mysore and Coorg, I., 5*, jab, Bannu, 23; Dera Ismail Khan, 181 ig &gt; Hasara, 14; Rawal Ftm 15; Shahpur,6g; Hoshiarpur, ir; Gurddspur, 55; Simla, n.</li> <li>Habitat.—A moderate-sized tree of the North-West Himálaya, from the Indus to Nepal, ascending to 6,000 feet; frequently cultivated as a hedge along roadsides and near Himálayan villages.</li> <li>Dye—Wardle writes as follows in his Dye Report: "The LEAVES do not yield much tinctorial matter by themselves, but if mordanted with G. x. mordant they give a fine bright clean shade of dark fawn, approaching to yellow. The leaves possess tannin, shown by the infusion blackening with a salt of iron." The sample examined by Mr. Wardle having been sent from the Panjab, the inference may be accepted that it is employed as a dye by the natives of that province, but the writer can find no mention of the fact in available literature.</li> </ul>                                                                                                                                                                                                                                                                                        |
| FIBRE.<br>Bark.<br>3IO                                    | Fibre,—A strong coarse fibre is obtained from the BARK by retting,<br>and is much employed by the Natives of the North-West Himálaya for<br>making ropes and nets. Captain Huddleston appears to have been the<br>first to bring this fibre to the notice of Europeans, in his Report on Hemp<br>cultivation, &c, in British Garhwal, published in the <i>Transactions of the</i><br><i>AgriHort. Soc. Ind., vol. viii., 260</i> , he wrote: "The branches of the tree<br>are cut from July till March, or at all seasons save the spring. The<br>sticks are soaked for a month or forty days in water, and when dry are<br>beaten on stones, and the bark stripped oft. One tree will give about<br>five seers of the inner fibre fit for making ropes and string, which is used<br>for tying up cattle and stringing cots. It is neither very strong not<br>durable, and is not to be had in any quantity." In another passage he<br>remarked: "The <i>Bhimal</i> ropes get stronger from wet for the time, but de<br>not last above eighteen months if kept constantly exposed to the weather."<br>Eighteen years later (in 1858) Lieutenant Pogson submitted samples of<br>the same fibre and rope from Simla, to the AgriHorticultural Society<br>of India. These were examined by the Fibre Committee,one of the mem-<br>bers of which reported as follows: "Weak and brittle; like all fibres from<br>the bark of trees it will not bear dressing. Very probably, if worked by<br>hand, a common sort of rope might be made of it for local use, but I de<br>not think it would ever become an article of commerce." Later the fibre<br>was employed for paper-making in the Kangra valley under European<br>supervision, with a fair amount of success, but, as in the case of the fibre<br>of G. tdiaefolia there would be little chance of its exportation for that<br>G'. 310 |

| Bhfmal Fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <u>,£?££</u> .                                                                                                                  |
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| purpose paying. In the report by Messrs. Cross, Bevan, and King<br>it is stated that "owing to the very short length of the ultimate fibre, i—<br>I'S mm., and the inferior character of the specimen it was not deemed<br>worthy of further investigation." An analysis by the same investigators<br>showed the fibre to contain 72 per cent, of cellulose to io <sup>p</sup> 6 of moisture.<br>Food and Fodder.—The LEAVES and YOUNG TWIGS are largely em-<br>ployed, wherever the plant is common, as fodder for cattle, sheep, and goats<br>and are said to increase the milk-giving powers. It is also stored for win-<br>ter fodder.<br>Structure of the Wood.—White, with a small mass of irregular heart-<br>wood, hard, giving out an exceedingly unpleasant odour, especially when<br>fresh cut, or burned, weight from 45 to 50lb per square foot. It is exten-<br>sively used for making oar-shafts, axe-handles, banghy poles, cot-frames,<br>and other articles in which elasticity and toughness are required.<br>Domestic Uses.—In the North-West Himalaya the dried BARK IS, from*<br>its fibrous nature, valued for sandal-making, and the green bark is em-<br>ployed by women for cleaning the hair. The DRY TWIGS, after the bark<br>has been separated by retting, make excellent torches, and are very largely<br>used in the lower Himálayan ranges for that purpose. | FOOD ft<br>FODDER.<br>Leaves.<br>311<br>Young Twigs.<br>312<br>TIMBER.<br>313<br>DOMESTIC.<br>Bark.<br>314<br>Dry Twigs.<br>315 |
| Grewia polygama, Roxb.; Fl. Br. Ind., I., jp/.<br>Syn.—GREWIA HELICTERIFOLIA, Wall.; G. VIMINEA, Wall.; G. LANCEO-<br>LATA, Heyne; G. LANCIFOLIA, Grak.; G. HIRSUTA, Wall.; G. ANG'USTI-<br>FOLIA, Wall.; G. BILOBA, Wall.; G. LANC&SFOLIA, Roxb,<br>Vein.—Kukur bicha, HIND.; Seta kata, seta andir, SANTAL; Gowh or<br>gowali, BOMB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3x6                                                                                                                             |
| References.—/? *£., Fl. Ind., Ed. C.B.C., 43r; Brandts, For. FL, 42:<br Thwaites, En. Ceylon Pl.,3i; Dale. & Gibs., Pomb.Fl., 26; Rev. A.<br>Campbell, Ec. Prod., Chutia Nagpur, No. 7^49; Christy, New Commercial<br>Plants & Drugs, VII., 49; Lisboa, U. PI. Bomb., 147, 230; *'or.<br>Adm. Rep., Chutia Nagpur, 1885, 28; NW. P. Gaz.:—I., fa-i IV., 69 •<br>X., 306; Ind. Forester, VIII., 417.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                 |
| Habitat.—A shrub or small tree of North-West India, extending along<br>the Himalaya from the Salt-Range to Nepal, ascending to 4,000 feet; also<br>met with in Chutia Nagpur, the Central Provinces, Konkan, Pegu, and<br>Ceylon.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                 |
| Medicine.—The Rev. A. Campbell reports that the FRUIT is employ-<br>ed as a medicine by the Santals, in cases of diarrhoea and dysentery.<br>The ROOT pounded is also prescribed for the same diseases, and powdered<br>in water is applied externally to hasten suppuration, and as a dressing for<br>wounds. The paste dries and forms a hard coating, thus effectually<br>excluding air from the raw surface. The knowledge of the medicinal<br>virtues of this plant in Chutia Nagpur is interesting, since an antidy-<br>senteric property is also attributed to it by the aborigines of North-West                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MEDICINE.<br>Fruit.<br>317<br>Root.<br>318                                                                                      |
| Australia. Mr. Christy commenting on its virtues writes : "Dr. W. E.<br>Arm it states that on one occasion having had to treat dysentery follow-<br>ing on fever and ague, this plant was pointed out to him by a native as a<br>sure remedy. He collected a quantity of LEAVES, and having made a pale<br>sherry-coloured decoction, administered about two table-spoonfuls for a<br>dose. Repeating this every four hours throughout the night, the sixth dose<br>made a complete cure. 'Since then,' says Dr. Armit, 'I have tried the<br>remedy in scores of cases, and I have never known it to fail, however seri-<br>ous.' <sup>97</sup> As already stated, the leaves contain tannin, which, together with<br>the mucilaginous properties peculiar to the whole genus, probably explains                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Leaves.<br>319<br>FOOD                                                                                                          |
| its special action.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fruit.                                                                                                                          |

Food.—The FRUIT is eaten in Chutia Nagpur.

181

G. 320

320

| GREWL<br>abrophy               | Edible Fruits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TIMBER.<br>321<br>322          | Structure of the Wood.—Similar to that of G. oppositifolia, but free from unpleasant odour.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 522                            | Grewia populifolia, <i>Vahl., Fl. Br. Ind., /., 383</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                | <ul> <li>Syn.—GREWIA BETULJEFOLIA, JUSS.; G. RIGIDA, Ham.</li> <li>****-Bursa, KOLJ Ganger, hanger, gangi, inzarre, hhircha, PB.,<br/>Shikári mewa, KOHAT; Khircka, indzar, PUSHTU; Gangerun, gangan<br/>ganegan, RAJ.; Gango, gangi, SIND.</li> <li>References.—Brandis, For. Fl., 38; Gamble, Man. Timb., 54; Stewar,<br/>Pb. Pl.,, 17; Bot. Tour in Hasara, in Your. AgriHort. Soc., XIV. (Ol<br/>Series), 33; Stocks, Report on Sind; Murray, Pl. and Drugs, Sind, 60<br/>Baden roweii, 70. Fr., 58; Balfour, Cyclop., I., 1253; J<sup>n</sup>&lt;* 7Z<sup>14</sup><br/>IV., 228, 233; VIII., 418; xII. {App.} \ y. GazetteersPanjd,, Bannu<br/>23; Dehra Ismail Khan, ig.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                | Habitat—A small shrub extending from the arid tracts of the Panjal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| FOOD.                          | Sind, Rajputana, and Western India, down to the Nilghiri Hills.<br>— FoodThe small, orange-red acid FRUIT is eaten by the Natives in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Fruit.<br><b>323</b>           | bind and the Panjab. Stewart describes it as having neither substance cukivation <sup>111</sup> ^ Stocks says /t is verv palatable and might be improved by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| TIMBER.<br>32+                 | Structure of the Wood.—Yellow, hard, close-grained; used for walking sticks. (Gamble.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 325                            | G. salvifolia, Heyne; Fl. Br. Ind., /, 386.<br>SynGREWIA BICOLOR, JMM./G. ARARIA, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                | <ul> <li>CIRCARS: Bursu, Sita pelu, cheli, Kol.; Sitanga, SANIA:<br/>Khorkhorendna, Mal. (S.P.); Bather, nikki-bekkar, gargas, PB.; Saras<br/>AJMERB; Heriss, seriss, serissa, katang, MFRWARA; Bihul, SIND; Jára<br/><u>CIRCARS</u>: Burdingurga, chipudi, putiki, TEL.</li> <li>References.—5r<sub>fl</sub>wrfw, For. Fl., &lt;3; Gamble, Man. Timb., S5t E<sup>l</sup>/<sup>1</sup>0*<br/>%L<sup>An</sup>#<sup>l</sup>&gt;-<sup>3</sup>!t<sup>4l</sup>&gt;<sup>160</sup>: Murray, PI. and Drugs, Sind, 66;/<sup>op</sup> Adm.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                | Habitat.—A small tree met with on the North-West Himålaya from the Jhei to Nepál, $alS_0$ in the PanJ* <sup>db, Sind</sup> the Central Provinces, and SoutherHndia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| FOOD.<br><b>326</b><br>TIMBER. | $f^{r}_{nH} = \int_{0}^{1} \int$ |
| 327<br>328                     | <b>G. scabrophylla</b> , <i>Roxb.; Fl. Br. Ind., /., 387; Wight, Ic, t. 89.</i> •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                | <ul> <li><sup>Sy</sup>S?T7<sup>GR</sup>/5<sup>W1A</sup> <sup>SC</sup>LEROPHYLLA, Wall.; G. CARREA, Hani.; G. SULCATA<br/>Wall.; G. PILOSA, Wall, (inpart); d. OBLIQUA, Roxb., not o/Juss.</li> <li>Ver:?—<sup>Pkar</sup>sia, (ru\t=g*rbhelL KuMAON: Pdndhari dhdman, khatkhau<br/>MAR. Z)««Mife, KAN.<sup>-</sup></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                | References. – Roxb., Fl. Ind., Ed. C.B.C., 430, 432; Brandis, For. Fl., 36<br>Kurs, For. Fl., Burm., I., 162; Pharmacographia Indica, I., 238<br>Gasetteers: – NW. P., IV., 64; X., 306; Bomb., XV., 70.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                | <b>Garhwál</b> , Assam, Chittagong, and Ava. It is also mentioned in the list of forest trees of the Kanara District in Bombay. It flowers in April, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FIBRE.<br><b>320</b>           | <b>Fibre</b> <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MEDICINE.<br>Roots.            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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• 182

| Grewia Paper. (J. Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | GREWIA<br>tiliaefolia                              |
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| used as a substitute for althea." It is doubtful to what part of the plant<br>the first sentence refers, but it may probably be to the scabrid LEAVES.<br>Food.—The FRUIT is of the size of a large cherry, nearly round, brown-<br>ish-grey when ripe, with a glutinous, pale yellow, pulp. II is eaten by<br>Natives.<br>Structure of the Wood.—In the Kandra Gazetteer, it is stated that<br>G. obliqua, Roxb., referred by the Flora, British India, to this species, is a<br>small tree, the wood of which is used for field tools and posts. Some<br>other species, however, is probably meant, since G. scabrophylla, Roxb., is                                                                                                                                                                                                                                                                                 | Leaves.331FOOD.Fruit332TIMBER.333                  |
| elsewhere a small shrub.<br>Grewia tiliaefolia, Vahl.; Fl. Br. Ind., I., 386.<br>,Syn.—GREWIA ARBOREA,'^^./ G. VARIABILIS, Wall, in part; G. SUBIN-<br>ifcguALis, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 334                                                |
| <ul> <li>Vern.—Pharsa, dhamin, dhdmani, HIND.; Dhamono, dharnan, URIYA;<br/>Dhamin, KOL.; Olat, SANTAL; Khesla, kasúl, GoND; Dhamni, KURKU &gt;<br/>Dhamni, damún, Q. P.; Ddmana, karakana, BOMB.; Dáman, dháman,<br/>MAR.; Dhamana, Guj.j Thada, tharra, TAM.; Dhamnak, BHILJ<br/>Charachi, tharrd, údúpai, tada, TEL.; Thadsal, dad sal, batala, bút die,<br/>KAN.\Sadachuy MALAY.; Daminne, SING.; Dhamni, dharmana, SANS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                    |
| References.—£ra»uft5, For. Fl., 41; Kurz, For. Fl., Burnt., I., 161; Bed-<br>dome, Fl. Sylv., t. 10S; Gamble, Man. Timb., 54; Thwaites, En. Ceylon<br>PI., 32; Dais. & Gibs., Bomb. Fl., 26; Elliot, Fl. Andhr., 172; Rev.<br>A. Campbell, Ec. Prod,, Chutia Nagpur, No. 9411; Dymock, Mat. Med.<br>W. Ind., 2nd Ed., 116; Pharmacograplva Indica, Pt. I., 237; Atkinson,<br>Him. Dist., 306; Lisboa, U. PL Bomb., 26, 147, 230, 277\ Balfour,<br>Cyclop., I., 1253; Kew Report, 1879, 34; Kew Off. Guide to the Mus. of<br>Ec. Bot., 21; Indian Forester, III., 23, 200; X., 222; XIII., 119; For.<br>A dm. Rep., Chutia Nagpur, 1885, 6, 28; Jour. AgriHort. Soc. of India,<br>V. (Old Series), Sel. 12; Madras, Man. of Admin., II., 82; Settlement<br>Reports:—Chandwara (C.P.), uo; Gazetteers:—Mysore &Coorg,I., 52;<br>Bombay, VII., 36; XIII., 24; XV., 40; XVII., 24; XVIII., 45; N%-W.<br>P.,I.,79;IV.,lxix. |                                                    |
| Habitat.—A moderate-sized tree met with in the hot dry forests through-<br>out the Sub-Himálayan tract, from the Jumna to Nepál, ascending to 4,000<br>feet; also in Central and South India, Burma, and Ceylon. It flowers in<br>April and May, and its fruit ripens from June to October.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                    |
| Fibre.—The BARK yields a fibre employed in many parts of India for<br>cordage. It, like the fibres of other Grewias, has been recommended for<br>paper-making, but is apparently little worthy of consideration. Speci-<br>mens were sent to Kew in 1878, and were, amongst other fibre-yielding<br>barks, examined by the late Mr. Rout ledge of the Ford Works, Sunder-<br>land. He described the fibre as "strong, harsh, wiry, hard," and stated<br>that the green-yield of the bark was 50 per cent., the bleached-yield 437.                                                                                                                                                                                                                                                                                                                                                                                     | FIBRE.<br>Bark.<br>335                             |
| As in the case of other Grewia fibres, it would not pay to export it to<br>Europe for paper-making purposes.<br>Medicine.— Dr. Dymock writes that, "In the Konkan the BARK, after<br>removal of the suber, is rubbed down with water, and the thick mucilage<br>strained from it and given in five-tola doses with two tolds of the flour of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE<br>Bark.<br><b>336</b><br>Wood.           |
| Ptnicum miliaceum, as a remedy for dysentery." Colonel Cox in his<br>•' Remarks on Certain Specimens of Wood from Central India" says that<br>the WOOD reduced to a powder acts as an emetic, and is employed by the<br>Natives as an antidote to opium poisoning. <i>{Journ. AgriHort. Soc. Ind.</i><br><i>loc. cit.</i> ). The BARK is also employed externally to remove the irritation<br>in cow-itch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bark.<br>338<br>FOOD.<br>Drupes.<br>339<br>FODDER. |
| Food and Fodder.—The small DRUPES are of an agreeable acid flavour,<br>and are eaten by Natives. The LEAVES and TWIGS are lopped for cattle<br>fodder.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Leaves                                             |
| G. 341                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                    |

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| GUAZUMA<br>tomentos                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| TIMBER.<br>342                                              | Structure of the Wood.—White, with a small brown heartwoodI: close<br>grained, hard, weight from 30 too 400 ftper cubic foot according too waruu h<br>48 ft according to Gamble. It is easily worked, elastic, and duable, a<br>is much used for shafts, shoulder poles, pellet-bows, axe-handles, m as<br>oars, fishing rods and other purposes for which elasticity, strength, an                                                                                                                                             |
|                                                             | toughness are required.<br>Grewia vestita, <i>Wall</i> , see p. 178.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 0.40                                                        | <b>G. villosa,</b> Willd.f FL Br. Ind., I., 388.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 343                                                         | <ul> <li>Syn.—GREWIA ORBICULATA, G. Don.</li> <li>Vern.—Gaphni, KOL.; Tarse kotop, SANTAL; Jalidar, kaskusn,<br/>ther, PB.; Insarra, pastuwanne, PUSHTU; Dhohan, AJMERE. ^ 'teor'</li> <li>References.—Brandts, For. FL, 3g; Dais. &amp; Gibs., Bomb. FL, *J i Brist<br/>art, Pb. PL, 27; Rev. A. Campbell, Ec. Prod., Ckutia M*£P.<sup>W</sup>&gt;?°\ W.<br/>Murray, PL and Drugs, Sind, 66; Lisboa, U. PL Bornb^, lf<sub>B</sub>&gt;*hayf<br/>Forester, IV.,228, 233; VIII., 418; XII. (App.), 8; GazetteerBomo y,</li> </ul> |
| MEDICINE.<br>Root.<br><b>344</b><br>FO <b>OD.</b><br>Fruit. | Habitat—A small shrub of Western and Southern India, extending<br>from the Panjdb and Sind to Travancore. i <sub>rt</sub> ved '<br>Medicine.—The Rev. A. Campbell states that the ROOT IS employ*<br>as a remedy for diarrhoea in Chutia Nagpur                                                                                                                                                                                                                                                                                 |
| 345                                                         | in the Panjab. $t_{TH}RACE^*$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                             | Grislea tomentosa, <i>Roxb.</i> , see Woodfordia floribunda, <i>Sahsh.</i> / X- <sup>Y#</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                             | Ground-nut, seeArachis hypogaea, <i>Linn.</i> , Vol. I., 282.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                             | Guano, see Collocalia nidifica, Gray; Vol. II., 503; also Manures, Vol.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                             | Guatteria longifolia, Wall, see Polyalthia longifolia, Benth.; ANO-                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                             | Guava, see Psidium Guyava, Linn.; MYRTACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                             | GUAZUMA, Plum.; Gen. PI, I., 223.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 346                                                         | [,t. 31; STERCULIACEJE,<br>Guazuma tomentosa, Kunth; FL Br. Ind.yL, 375 s Wight, HU<br>THE BASTARD CEDAR.                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                             | Syn. — BUBOMA TOMENTOSA, Spreng.; GUAZUMA ULMIFOLIA, Wall.; Diu-                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                             | ROGLOSSUMRUFHSCENS, Turcs.<br>Vern.—Banddq.ke'-jhdr-ki-chkdL phc.; Thain-p&chie, ^ " A ^ V ^ J S "<br>sum, TAM. 5 Rudraksha, udnk-batta, TEL.; Bucha-pattot* rudratehe,<br>KAN.                                                                                                                                                                                                                                                                                                                                                 |
|                                                             | <b>References.</b> —Kurz, For. FL Burnt., I., 149; Beddome, FL Sylv., t., 107;<br>Gamble, Man. Timb., 45: Thwaites, En. Ceylon « , », J : «                                                                                                                                                                                                                                                                                                                                                                                     |
| FIBRE.                                                      | Sheriff, Mai. Med of Madras, 68; Drury, U. Pl., 236; Lisboa, U. Pl.,<br>Bomb., 26, 105, 229; Royle, Fib. Pl., 265, 266, 267, 268; Cross, Bevan,<br>and King, Hep. on Indian fibres, S3 / *K*Yi *********************************                                                                                                                                                                                                                                                                                                |
| Branches<br>347                                             | Fibre—The straight, luxuriant, young BRANCHES yield a fibre which<br>was submitted to experiments by Dr. <b>Roxburgh</b> , and found to be of con-                                                                                                                                                                                                                                                                                                                                                                              |
|                                                             | G. 347                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| I ne Bastard Cedar—a Useful Rope Fibre. 3. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | speciosa.                                                                         |
| siderable strength, breaking at 100ft. when dry and 1401b when wet.<br>Messrs. Cross, Bevan, and King have recently examined it, and state as<br>the result of their observations that the ultimate fibre is 1 to 2 mm. in<br>length, and that if the plant were cultivated for the purpose, it would<br>probably yield a fibre which would prove useful for rope-making.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | FIBRE.                                                                            |
| Medicine.—The medicinal properties of this tree appear to have been<br>first brought to notice by Lindley who wrote: "In Martinique the infusion<br>of the old BARK is esteemed as a sudorific, and as useful in cutaneous dis-<br>eases, and diseases of the chest." Moodeen Sheriff in his forthcoming<br><i>Materia Medica of Madras</i> , proofs of which have been obligingly furnished<br>to the editor, describes the bark as tonic and useful in some of those cases<br>for which calumba and gentian are generally prescribed. The preparation<br>recommended by him is a decoction prepared as follows : "Take of the<br>inner bark, cut into small pieces or in coarse powder, four ounces; water<br>one pint and a half; boil till the liquid is reduced to one pint, and strain                                                                    | MEDICINE.<br>Bark.<br><b>348</b>                                                  |
| when cool; dose from two to three fluid ounces." The inner bark is esteemed as a remedy for Elephantiasis in the West Indies.<br>Food and Fodder.—The FRUIT, which contains a sweet'and agreeable mucilage, is edible. The LEAVES are valued as fodder in the Bombay Presidency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FOOD.<br>Fruit.<br><b>349</b>                                                     |
| Structure of the Wood.—Loose-grained, light-brown or brown, streak-<br>ed, coarsely fibrous, takes a good polish; weight, according to Skinner,<br>32ft per cubic foot. It is employed in Southern India for furniture, the<br>panels of carriages, and packing-cases.<br>Industrial Uses, &c.—The glutinous decoction of the inner bark is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | FODDER.<br>Leaves.<br><b>35</b> 0<br><b>TIBB</b> ER.<br><b>351</b><br>INDUSTRIAL. |
| employed in the West Indies for clarifying sugar. The tree is admirably<br>adapted for avenues, and has been largely planted in Southern India for<br>this purpose, as well as for fodder.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 352                                                                               |
| GUETTARDA, Linn.; Gen. PL, /., gg.<br>Guettarda speciosa! Linn.; FL Br. bid., III., 126; Wigāiy Ic <sub>9</sub><br>[/. 40; RUBIACXE.<br>Syn.—CADAMBA JASMINIFLORA, Sonnet.; NICTANTHES HIRSUTA, Linn.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 353                                                                               |
| JASMINUM HIRSUTUM, Willd.<br>Vern.—Pannir, DEC.: Panir, TAM.; Panniru fiuwu, TEL.; Rava-pu,<br>MALAY.; Domdomah, AND.; Wal-pichcha, nil pitcha, SING.; Himma,<br>SANS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                   |
| References.—Roxb., FL Ind., Ed. C.B.C., 230; Kure, For. Fl. Burnt.,<br>II., 37; Beddome, Fl. Sylv., Anal. Gen., t.17, f 2; Gamble, Man. Timb.,<br>229; Elliot, Fl. Andhr.y 144; Rheede, Hort. Mai., t. 47,48; Drury, U.<br>PL, 237; Trimen, Cat. Ceyl. PL, 43; Balfour, Cyclop., /., 1259.<br>Habitat.—A moderate-sized evergreen tree found in tidal forests<br>along the shores of Southern India, the Andaman Islands, and Ceylon.<br>Distributed along the tropical shores of the Old and New Worlds.                                                                                                                                                                                                                                                                                                                                                       | DOMESTIC.                                                                         |
| Domestic and Sacred Uses.—Drury quoting Persoon writes: "The<br>flowers of this tree are exquisitely fragrant. They come out in the even-<br>ing, and have all dropped on the ground by the morning. The natives in<br>Travancore distil an odoriferous water from the corollas, which is very<br>Ske rose-water. In order to procure it they spread a very thin muslin<br>cloth over the tree in the evening, taking care that it comes well in contact<br>with the flowers as much as possible. During the heavy dew at night the<br>cloth becomes saturated, and imbibes the extract of the flowers. It is<br>then wrung out in the morning. This extract is sold in the bazars." The<br>writer can find no other reference to this interesting product in available<br>literature. The tree is considered by the Hindus to be sacred to Siva<br>and Vishnu. | Berfumery.<br>354                                                                 |
| . G. <b>354</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                   |

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| GUIZOTIA                            | Niger Seed and Oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| abyssynica                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                     | [Vol. IL, 3;                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                     | Guilandina Bonduc, W. & A., see Caesaipinia Bonducella, Fleming:<br>Guinea-corn, see Sorghum vulgare, Pers.; GRAMINEJE,                                                                                                                                                                                                                                                                                                                                                            |
|                                     | Guinea-graSS, see Panicum jumentorum, Pers.; GRAMINES.                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 355                                 | GUIZOTIA, Cass.; Gen. PL, IL, J<22.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 555                                 | <b>Guizotia abyssynica,</b> Cass.; FU Br. Ind., III., 308; Wight, HU ' $\setminus ^*3^*s$ COMPOSITE.                                                                                                                                                                                                                                                                                                                                                                               |
|                                     | NIGER SEED AND OIL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                     | SynG. OLEiFERA, z?C.; HBLIANTHUS OLEIFERA, Wall; BIDENS RAM-<br>TILLA, Wall.; RAMTILLA OLEIFERA, DC; HFILIOPSIS PLATYOLO22<br>Cass.; VERBESINA SATIVA, BOU Mag., 1.1017, Roxb.; POLYMNIA<br>SYNICA, Linn, f.                                                                                                                                                                                                                                                                       |
|                                     | Vern.—Kdld-til, surgtya, HIND.; Rdm-til, sirg&ja, sirg&ea, BENG.; Surg*,<br>ja <sub>t</sub> K0L;SurgHja <sub>t</sub> SANTAL; Rdmatila, kerani, BOMB.; Kalt't*LMAK.,<br>ValesuU, vufist, TEL.; Huchchellu, ram-til, KAN.                                                                                                                                                                                                                                                            |
|                                     | References!?^., Fl. Ind., Ed. C.B.C., 606; Dalz. & Gibs., Bomb. Fl.,<br>; Ettior, Fl. Andar., 193; Kev. A. Campbell, Ec. Prod. Chutia<br>Nagpur, No. 7865; Ainslie, Mat. Ind., II., 256; Dymock, Mat. Med.<br>W. Ind., and Ed., 432; Drury, U. Pl., 238; Lisboa, U. Pl. Bomb., 163,<br>219; Birdwood, Bomb. Pr., 303; McCann, Dyes and Tans, Beng., 31,<br>2455; Capbe Oile and Oilback & Simon of Comparing Products,                                                             |
|                                     | 535; Special Reports from Collector of Cuddapah; Y. B. Fuller, Esq.,<br>C.S., Central Provinces; Dir., Land Rec. and Agric., Bengal; Mad-<br>cross Research Strain States and Agric., Sengal; Dic.                                                                                                                                                                                                                                                                                 |
|                                     | Off. Guide to the Mus. of Ec. Bot., 85; Simmonds, Trop. Agri., 415;<br>AgriHort. Soc. Ind., Journals (Old Series), VII., 40, 41, (Pro.), 21;<br>VIII., 61, (Pro.), 8; IX., 47; Gazetteers :- Mysore and Coorg, I., 56; II.,                                                                                                                                                                                                                                                        |
| ,                                   | "Habitat.—A stout, erect leafy herb, native of Tropical Africa, but ex-                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                     | tensively cultivated as an oil-seed in various parts of India.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| CULTIVA-<br>TION.                   | <b>Cultivation.</b> —Owing to the agricultural returns embracing all <sup>oil</sup> <sup>s</sup> <sup>A</sup> <sup>T</sup> crops under one general heading, it is difficult to obtain figures of the                                                                                                                                                                                                                                                                               |
| 356                                 | exact extent of the cultivation of NIGER OIL-SEED in India. In <sup>an</sup> swer to enquiries, however, the following reports have been kindly furnished,                                                                                                                                                                                                                                                                                                                         |
|                                     | and from these a fair idea of the amount grown in the more important re-                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>.</b> .                          | gions may be obtained.<br>BENGAL.—The Director of Land Records and Agriculture writes:                                                                                                                                                                                                                                                                                                                                                                                             |
| Bengal.<br>357                      | "Is largely grown in Chutia Nagpur on <i>ban</i> land, <i>i.e.</i> , land near home-<br>steads. It generally follows <i>gora dhan</i> , or upland rice. It is sown m<br>August either alone or with some pulse like <i>kiilti</i> ( <b>Dolichos</b> biflorusj.<br>Beyond a few ploughings the fields do not receive any other treatment.<br>The amount of seed sown per acre varies from 20 to 3° seers# <b>The crop</b>                                                           |
|                                     | is harvested in November-December. The produce on an average, is<br>four maunds of oil-seed valued at R5-8 per acre. The area under tor <sup>3</sup><br>guea was found by Mr. Slack, Settlement Officer, to be oil per cent, of the<br>total cultivated area. In Palamow it is not grown to this extent, its place<br>being taken by <i>til</i> (Sesamum indicum). The oil is used extensively by the<br>natives for cooking and anointing purposes. It is known to be extensively |
| Central<br>Provinces.<br><b>358</b> | exported to Calcutta through Purulia."<br>CENTRAL PROVINCES.—J. B. Fuller, Esq., C.S., Officiating Junion<br>Secretary to the Chief Commissioner, furnishes the following : "Niger seed<br>is a very important product of the hill-tracts in these Provinces, and furnish<br>es the hill tribes with the principal means of earning money. It is grown<br>during the rains, generally on the flat stony land which lies along the<br><b>G. 358</b>                                 |

| Kersanf Seed and Oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (                                                        | J. Murray.)                                                   | GUJZOTIA<br>abyssynica. |
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| summits of trap hills, and which at first sight<br>unproductive. The surface of this land is co-<br>laterite and what soil it carries is of the thinn<br>resting fallows after every three or four years it<br>niger or <i>kadon</i> .<br>"The districts in which the growth of niger s<br>portance are the following :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | vered with ne<br>lest description<br>can yield very      | odules of red<br>on. Yet with<br>y fair crops of              |                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Area unde                                                | r Niger in                                                    |                         |
| DISTRICTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1885-86.                                                 | 1SS6-87.                                                      |                         |
| Saugor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Acres.<br>30,442<br>20,485<br>64»356<br>55,348<br>74,795 | Acres.<br>Not stated.<br>18,701<br>54,540<br>48,575<br>74,148 |                         |
| MADRAS.—The Collector of Cuddapah writes : "A three months' crop<br>sown both in January and July, in drylands (generally red loam), in Cud-<br>dapah (200 acres) and in Pulivendula. The seed is sold at from 14 to 15<br>seers a rupee; the cost of cultivation is R7 and the profit R15 an acre." The<br>following note has also been furnished by the Madras Government:" Grown<br>in many parts of the Presidency to a small extent. In South Arcot it is<br>sown on red loam in both January and July and is a three months' crop.<br>Cost of growth R7; profit R15. Seed sells at 18 measures per rupee; oil<br>is extracted and mixed with gingelly oil." No further particulars regard-<br>ing the total area under the crop in Madras are available, but the follow-<br>ing account by Drury of the method of cultivation pursued in Mysore<br>may be quoted: "The seed is sown in July or August after the fir,, 'heavy<br>rains, the fields being simply ploughed, neither weeding nor manure being<br>required. In three months from the sowing, the crop is cut, and after be-<br>ng placed in the sun for a few days, the seeds are thrashed out with a<br>tick. The produce is about two bushels an acre. In Mysore the price is<br>about R3-8 a maund." |                                                          | 359                                                           |                         |

Oil.—The shining, black, ACHENE yields a clear, limpid, pale, sweet oil largely employed for culinary and lighting purposes throughout India. From a chemical analysis of the achene, given in Watts, Dictionary of *Chemistry*, it would appear that the actual percentage of oil which it contains is 43\*22, but 35 per cent, is the maximum yield recorded, or 10 per cent, less than the vield from the *til* seed (Sesamum indicum). In the Deccan it is the chief substitute for *ghi* amongst the poorer classes, and the achenes after extraction of the oil are used to make oil-cake which is considered a valuable food for milch-cows. From its inferior quality and low price it is also extensively used to adulterate gingelly and castor oils. In 1851 the seed was reported on by brokers in London as follows: "It has been imported from Africa as Niger seed, and from Bombay as kersani seed, and the present value (1857) of the quality represented by the sample is 37s. per quarter, taking the value of rape seed at 485. The oil is good, but the yield is only about 16 gallons against an average of about 20 from rape seed per quarter. The cake is unfit for feeding, and could only be used for manure, owing to the horny excrescence (sic) and dry, heating property of it. The average weight of this seed is also deficient of that of rape seed by 8tb per bushel, which is of great moment in making calculations for shipment. There is no doubt it would meet with a ready sale at its relative OIL. Achene. **360** 

| GUMS.                                                                                                                   | Gulal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE.<br>Oil.<br><b>361</b><br>FOOD.<br>Oil.<br><b>362</b><br>Sads.<br>DOMESTIC<br>Oil.<br><b>364</b><br><b>365</b> | <ul> <li>value to rape-seed." (Jour. AgriHort. Soc. fad.) The present price of <sup>th</sup>e"seed<sup>1&gt;</sup> in Bombay is about R6J per pharrah of 35a \Dymock). Medicine.—The OIL may be used for the same pharmaceutical purposes as sesamum oil.</li> <li>Food.—The OIL is much used for culinary purposes and as a substitute for ghi by the poorer classes in the regions where it is cultivated. In Madras the SEEDS are sometimes fried with oil or ghi and eaten.</li> <li>Domestic and Industrial Uses.—The OIL is, when refined, fairly good for lighting purposes, and has been reported as "capital for painting and cleaning machinery." Like other sweet oils it is largely used in this country for anointing the body.</li> <li>Gulal, a coloured powder used along with Abir at the Holt festival. It is generally prepared from sappan wood, alum, and flour, but has of recent years been largely supplanted by a cheap powder coloured by means of an aniline dye. See ADIT, Vol. I., 65 also Curcuma Zedoaria, Roscoe; Vol. II., 669.</li> </ul>                                                                                                                                                                                       |
|                                                                                                                         | Gulancha, see Tinospora cordifolia, Murs,; MENISPERMACE#.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 366                                                                                                                     | GUMS AND RESINS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| r                                                                                                                       | plants are described in this work. These products will also (as mentioned<br>in the short note under the heading Domestic and Sacred, Ill.» 19))<br>form the subject of a collective article in the Appendix, in which they will<br>be classified, and an enumeration of the plants yielding them will be<br>given. It may, however, be useful in this place tto mention those of<br>chief commercial value, and to refer to the views of experts in England<br>as to the prospects of the Indian gum trade. For this purpose the follow-<br>ing list may be given, which was selected by Mr. O. Christy (of Messrs.<br>Ha, <sup>10</sup> and Sons) at the Colonial and Indian Exhibition, as most likely to<br>meeffhe demands of the European market :<br>Acacia arabica.<br>A. Sundra.<br>A. Sundra.<br>A. Sundra.<br>BalsamodendroD Mukul.<br>Butea frondosa.<br>The same expert remarked at a conference on the gums shown at the<br>Exhibition that owing to the troubles in the Soudan, and the consequent                                                                                                                                                                                                                                                 |
|                                                                                                                         | Exhibition that, owing to the troubles in the Soudan, and the consequent<br>impairment of Egyptian trade, the supply of gums from India had greatly<br>increased, and that if it could be possible to induce the Natives to collect<br>any one of the gums above referred to, pure, and free from dirt, a large and<br>important trade would immediately open out. The great disadvantage of<br>Indian gums imported at that time consisted in the mixture of different<br>kinds, resulting from the consignments having to be opened out, reasserted,<br>and sold as broken packages which never realised anything like their pro-<br>per value. Mr. Christy strongly advocated attention being paid to this<br>fact, and urged that, if possible, the natives should, through the agency of<br>Government, be taught to prepare honest consignments. It may be of<br>interest to note that the subsequent trade statistics of Indian Gums and<br>Resins fully substantiate Mr. Christy's statements. The exports from<br>India excluding Cutch in 1883-84 immediately before the Exhibition were<br>only 2,180 cwt., valued at 824,538, in 1885-86 they had increased to<br>55,407 cwt., valued at Ri5»97»997, while in 1887.88 they had again<br><b>G. 366</b> |

| Gun-stocks and Gun-carriages. (J. Murray,)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | GYMNEMA<br>.sylvestre. |  |
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| decreased to 37,132 cwt. of a greater proportionate value, however, amount-<br>ing to Ri7,54»963- It is encouraging to notice that in the last year for<br>which statistics are available, 1888-89, the amount had again increased<br>to 62,136 cwt., valued at the considerable sum of R28,27,999. It may thus<br>be justly inferred that the remarks of Mr. Christy at the conference<br>above alluded to, had the desired result of attracting the attention of<br>Indian merchants to the subject at the most favourable moment.<br>For further information see the description of the above enumerated<br>plants in their respective alphabetical positions, also the account of Bassora,<br>or Hog-gums, Vol. I., 417.                                                                                                      |                        |  |
| Gunny-bagS, see Corchorus, Vol. II., 561; also Jute, Vol. IV., p. 558.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                      |  |
| <b>Gunpowder-charcoal.</b> For a list of the timbers used in making this ingredient of gun powder, see Charcoal, Vol. II., 264.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |  |
| <b>Gutl-StOCks</b> and <b>Gun-carriages.</b> The following are the principal timbers employed (or which might be so) in India for the construction of gunstocks and gun-carriages; for a complete description of which the reader is referred to the article on each in its respective alphabetical position :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3fi7                   |  |
| Adina cordifolia, Hook.f. & Bth.<br>Careya arborea, Roxb.<br>Cedrela Toona, Roxb,<br>Celtis australis, Linn.<br>Chloroxylon Swietenia, DC.<br>Cordia Myxa, Linn.<br>Dalbergia latifolia, Roxb.<br>D. Sissoo, Roxb.<br>Dillenia indica, Linn<br>Eriolcena Candollei, Wall.<br>Ehretia acuminata, Br.<br>Gmelina arborea, Roxb.<br>Hopea odorata, Roxb.Juglans regia, Linn.<br>Lagerstroemia Flos-reginae, Rets.<br>Melanorrhcea usitata, Wall,<br>Mesua ferrea, Linn.<br>Morus serrata, Roxb.<br>Pistacia integerrima, Stewart*<br>Pterocarpus indicus, Willd.<br>Rhododendron arboreum, Sm.<br>Shorea robusta, Gcertn.<br>Taxus baccata, Linn.<br>Tectona grandis, Linn. f. **<br>Thespesia populnea, Corr?                                                                                                                       | •                      |  |
| Gurjun or Garjan, see Dipterocarpusturbinatus, Gaertn.f., Vol. III., 161.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |  |
| Guttapercha, see Dichopsis Gutta, Bth. and Hook.f., Vol. III., p. 103.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                      |  |
| <b>GYMNEMA, Br.;</b> Gen. <b>/&gt;/., II.,</b> 769.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |  |
| <ul> <li>Gymnema sylvestre, Br., - Fl. Br. Ind., IV., 29; Wight, Ic, t. 349;<br/>[ASCLEPIADEA:</li> <li>Syn. ecylanica ; MELICIDA, Edgew.; PERIPLOCA SYLVESTRIS, Willd. /<br/>ASCLEPIAS GEMINATA, Roxb.</li> <li>Var. ceylanica ; distinguished by its ovate cordate leaves, softly pubescent<br/>on both surfaces. G. sylvestre var. Decaisneana, Thw. (excl. syn.)</li> <li>Vem.—Méra-singi, HIND.; Meta-singi, chhdta-dudhi-lata, BENG.; Par-<br/>patrah, DEC.; Kavail, wakandi, BOMB.; Shiru-kurunjd, TAM.; Poda-<br/>patra, putla-podara, TEL.; Binntig, SING.; Mesharingt, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 256; Thwaites, En. Ceylon PL,<br/>197; Dais. &amp; Gibs., Bomb. FL, IS; Grah., Cat. Bom. PL, 120; Elliot,<br/>El Andhr, 154: Pkarm Ind. 143: Ainslie Mat. Ind. II. Or Moodean</li> </ul> |                        |  |
| <ul> <li>Fl.Andhr., 154; Pkarm. Ind., 143; Ainslie, Mat. Ind., II., Yoy Moodeen Sheiif, Supp. Pharm, Ind., 151; U. C. Dutt, Mat. Med. Hxnd., 30g; Dymock, Mat. Med. W. Ind., 2nd Ed., 521; Hooper, an Examination of the Leaves of Gymnema sylvestre, Ootacamund, 188y; Edgeworth, Pharm Jour., VII., ssr; Balfour, Cyclop., I., 1277; Gazetteers:—NW. P., I., 82; IV., Ixxvi., Bombay, XV., 438.</li> <li>Habitat.—A stout, large woody climber, native of Central and Southern India, from the Konkan to Travancore; distributed to Tropical Africa.</li> </ul>                                                                                                                                                                                                                                                                 |                        |  |

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| GYNANDROPSIS Gymnema Indigo                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
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| pentaphy                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
| MEDICINE.<br>Root.<br>369<br>Leaves.<br>370 | Medicine.—The ROOT has long been esteemed amongst the Hindús as<br>a remedy for snake-bite, the powdered root being applied to the part bitten,<br>and a decoction administered internally. But the most curious property of<br>the plant was first noticed and described by Mr. Edgeworth, who dis-<br>covered that on chewing some of the LEAVES the power of taste for sac-<br>charine materials was completely destroyed for 24 hours; powdered sugar<br>tasting like so much sand. Dr. Dymock, criticising this statement says,<br>that in his experience sugar taken into the mouth after chewing the fresh<br>plant, had a saltish taste, but was still easily recognisable. Mr. Hooper,<br>however, repeated the experiment and in his paper above cited, states that<br>"after chewing one or two leaves it was proved undoubtedly that sugar had<br>no taste immediately afterwards, the saltish taste experienced by others<br>was due to an insufficiency of the leaf being used." He also further dis-<br>covered that the leaf had the valuable property of completely removing the<br>taste of bitters, sulphate of quinine after a good dose of the leaf tasting<br>like "so much chalk." He, and several friends who also tried the experi-<br>ment, found however that the effect did not last for 24 hours as stated by<br>Edgeworth, but for only one or two. Mr. Hooper also found that Gym-<br>nema had no effect on the appreciation of the taste of pungent or saline<br>articles, nor of astringents and acids. Though of opinion that this property<br>might prove of value in pharmacy for the purpose of destroying the taste<br>of quinine, he writes," I am not going to propose its use in the adminis-<br>tration of nauseous drugs, until the properties of the Gymnema have been<br>more studied, otherwise the quantity of the vehicle taken may be proved<br>to counteract the effect of the medicines." The leaves have been subjected<br>to a careful and thorough analysis by Mr. Hooper, the results of which<br>have been published in the above cited paper, to which the reader is referred |  |  |
| 771                                         | for further information regarding their chemical composition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| 371                                         | Gymnematingens, W. & A.; Fl. Br. Ind, IV., 31.<br>- Syn.—GYMNEMA TINGENS, var. CORDIPOLIA, Wight, Ic, t. 593; BiDABIA<br><sup>Af'</sup> TINGENS, Dene.; ASCLEPIAS TINGENS, Roxb.<br>References.—Roxb., Fl. Jnd., Ed. C.B.C., 258; Balfour, Cyclop., /., 1277 t<br>AgriHort. Soc. Ind., Journals {Old Series}, VI., i/f3, 144; X., 294, 303.<br>Habitat.—A climbing shrub, native of the Tropical Himalaya (from Ku-<br>mdon to Sikkim), Assam, Sylhet, Lower Bengal at Monghyr, Pegu, and<br>Travancero                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| DYE.<br>372                                 | Travancore.<br>Dye.—In 1795 Dr. Buchanan brought specimens of this plant from<br>Pegu to India, and informed Dr. Roxburgh that the Burmans extracted<br>a green colour from the leaves. The latter examined them and wrote:<br>"It is probable that those people forgot to inform the Doctor that it was<br>necessary to dye the cloth yellow, either before or after the application of<br>the colour prepared from the leaves of this plant; in which case it will be<br>the second species of Asclepias described and figured by me, which yields<br>Indigo; though for my part, I have not succeeded in procuring that mate-<br>rial from the leaves."<br>GymnOSporia, W. & A., see Celastrus, Linn.; Vol. II., 237.<br>GYNANDROPSIS, DC, Gen. PI, /., 106.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
| 373                                         | Gynandropsis pentaphylla, DC, Fl. Br. Ind., I., 77/; CAPPARIDEZE.<br>Syn.—CLEOME PENTAPHYLLA, Linn,<br>Vern.—Hárhár, hálái, karaila, churota, HIND.; Hurhuriá, kánálá, ansa-<br>rishá, arkahuli, sádáhurhuriá, BENG.; Seta kata arak, SANTAL.; Kathal<br>privina «w. r.; namai, DEC; Ainro, BIND.; THávana, maoti, WAR. i<br>««, neivaylla, kadughu, TAM.; Vdminta, vela *wra, TEL.; Tai-v£U><br>kara-viU, vila, MALAY, J WV/a, SING.; Surjdvarta, arkapushpikd, SAN S.<br>G. 373                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |

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| Convolution and Oil (7 Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NDROPSIS                                                                                  |
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| pent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>taphylla.</u>                                                                          |
| <ul> <li>(For vernacular names Conf. with Cleome viscosa, Linn,; Vol. II., 37°-The two plants are much confused by Indian writers —Ed.)</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 500; Wight, III., I., J4; Stewart, Pb.Pl 18; Elliot, Fl.Atidhr., 189; Rev.A. Campbell, Ec. Prod., Chutia Nagpur, Nos. 8102, 8783; Pharm. Ind., 25; Pharmacographia Indica, 132; 'Ainslie, Mat. Ind., II., 451; O'Skaugknessy, Beng.pisj.ens.,206; Moodeen Sheriff, Sitpp. Pharm. Ind., 151; Mat. Med. of Madras, 2fi; U. C. Dutt, Mat. Med. Hind., 202, 319, ; Dymock, Mat. Med. W. Ind., 2nd Ed., 62; S. Arjun, Bomb. Drugs, 13; Murray, Pl. and Drugs, Sind, 50 &amp; Rodae Domooli Ph. Pv. 200. Atbinson. Him. Dist., 738: Drury. U. PL, 238; Lisboa, U. PI. Bon.b., 14S; Stocks, Rep. on Sind; Darrah, Note on the condition of the People of Assam ; Home DepU Cor. regarding a revised Fkarmacopwia, 239; Indian Forester, HI., 237; XII. (App.), 5; Gazetteers i—Orissa, II., 79; Mysore and Coorg, I., 57; NW. P., H't 791 V-&gt; lxvii.s X., 305; Trimen, Cat. Ceylon PL, 4; Rheede, HorU</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                           |
| • <i>Mai., IX., t. 34.</i><br>Habitat.—A small, annual herb, abundant throughout the warnter parts of India, and all tropical countries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                           |
| Oil.—When crushed in the fresh state, the HERB yields an acrid volatile<br>oil having the properties of garlic or mustard oil. ( <i>Pharmacog. Indica.</i> )<br>Medicine.—Ainslie noticed the medicinal properties of the plant, thus :—<br>"The small numerous, warmish, kidney-formed black SEEDS, as well as the<br>LEAVES of the plant, are administered in decoction in convulsive affections<br>and typhus (?) fever, to the quantity of half a tea-cupful twice daily."<br>"The Cyngalese physicians use our article for nearly the same purposes<br>that the Vytiansdo." Sir W. Jones ( <i>Vol. V.g138</i> ) observed that the sensible<br>qualities of Cdravilla promise great antispasmodic virtues, since it had a scent<br>much resembling asafcetida, but comparatively delicate. Later Dr. Wight<br>and several other English writers, following his opinion, have written of the<br>bruised leaves as rubefacient and vesicant, producing a very copious exuda-<br>tion, and affording in many cases the relief obtained from a blister, without<br>the inconveniences of the latter. Moodeen Sheriff, however, in his fbrth-<br>coming <i>Materia Medica of Madras</i> , states that the leaves of G. pent^hylla<br>are neither distinctly rubefacient, nor do they possess a scent resembling asa-<br>foetida ; he maintains that these properties have been assigned to them<br>owing to confusion of the plant under consideration with Oleome viscosa.<br>His observations seem, however, at variance with the chemical nature of the<br>fresh leaves above described under On. The following properties and uses<br>appear to be unquestioned. The seeds are anthelmintic and rubefacient and | OIL.<br>Herb.<br><b>374</b><br>MEDICINE.<br>Seeds.<br><b>375</b><br>Leaves.<br><b>376</b> |
| are employed internally for the expulsion of round-worms, and externally<br>as a counter-irritant. The JUICE OF THE LEAVES is used in many parts of<br>the country as an anodyne instillation for the relief of otalgia and catarrhal<br>inflammation of the middle ear. In certain localities the leaves are applied<br>externally to boils to prevent the formation of pus. A decoction of the ROOT<br>is said to be mildly febrifuge. The following note kindly furnished by<br>Moodeen Sheriff indicates the best methods of exhibition of the various<br>medicinal parts of the plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Juice.<br>377<br>Root.<br>378                                                             |
| SPECIAL OPINIONS.—§"The seeds are anthelmintic' and the leaves a remedy for a few diseases of the ear. They are employed internally for the oipulsion of round-worms; and externally their application to the skin is attended with relief in all cases in which mustard is indicated. The                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -                                                                                         |

remedy for a few diseases of the ear. They are employed internally for the oipulsion of round-worms; and externally their application to the skin is attended with relief in all cases in which mustard is indicated. The juice of the leaves is often used by natives for the relief of otalgia and otorrhcea and occasionally with success; but the burning sensation it produces in the ear, particularly in the cases of the latter disease, is a drawback to its employment. The seeds are prescribed internally in powder, which should always be used with sugar; and externally in the form of a poultice or paste, by bruising them with vinegar, lime-juice, or hot water.

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| GYNOCAR<br>odorata                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| MEDICINE.                                             | For the use of the ear, the juice of the leaves is to be pressed out by bruising them without water. The dose of the powder is from 30 grains to one drachm, with sugar, morning and evening for two days, and followed on the third morning by a dose of castor oil. For children the dose is from five to twenty grains according to their age." (Honorary Surgeon Moodeen Sheriff, Khan Bahadur, G.M.M.C., Trlipicane, Madras). "The expressed juice of this plant, a lttile warmed, is a useful remedy for ear-ache. It is also used internally in cases of bronchitis. It is purgative, but rarely used for that purpose." {Civil Surgeon J. H. Thornton, B.A.,M.B*> Monghyr).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| FOOD.<br>Leaves.<br><b>379</b><br>DOMESTIC.<br>Seeds. | Food.—The LEAVES are eaten by natives in curries, and as a pot-herb.<br>( <i>Roxb.</i> )<br>Domestic Uses.—The SEEDS are used, rubbed up with oil, as,? vermi-<br>cide in dressing the hair. They are also said to be employed for poison-<br>ing fish.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 380                                                   | GYNOCARDIA, JR. Br.; Gen. PI., /., 129.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 381                                                   | Gynocardia odorata, R. Br.; Fl. Br. Ind., I., 19s; BIXINIJE.<br>THE CHAULMUGRA OIL.; LUCRUBAU OR LUKRABO SEEDS.<br>Syn.—CHAULMOOGRA ODORATA, Roxb. / CHILMORIADODECANDRA, Ham.<br>Vem.—Chdlmugra, chhalmtigra, chavulmungri, HIND.; Chaultn4gri,pe»<br>tarkura, BENG.; Kadu, NEPAL; T&k-kung, LEPCHA; Chaulmugra,<br>BOMB.; Tungpung, MAGH.; Taliennoe, SING.; Brinj-mdgrd, PERS./                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| OIL.<br>Seeds.<br><b>382</b>                          | <ul> <li>References. — Roxb., Fl. Ind., Ed. C.B.C., 740; Kure, For. Fl. Burm., gl., 76; Gamble, Man. Timb. i8; Pharm. Ind., 26; Pharmacoff. Jwgf Jj., 743; O'Shaughnessy, Beng. Dispens., 2005; Pharmacoff. Jwgf Jj., 743; O'Shaughnessy, Beng. Dispens., 2005; Moodeen Sheriff, Subpl. 7 Mat. Ind., 151; Mat. Med. of Madras, 33; Dymock, Mat. Med. W. Ird., 2nd Ed., 07 / Fluck. &amp; Hanb., Pharmacog., 75; U. S. Dispens., anth &amp; A. J. O'Shaughnessy, Med., 412, 28; Waring, Bazar Med., 41; K. L. Dey, J*d*4, Drugs of India, 58; Irvine, Mat. Med., Patna, 72; Martindale apa Westcott, Extra Pharmacop., sth Ed., 270; British Meal. Journ., 18798 []&gt;× 431, 968; 1880; IL, 844; 1881, i., 4J5, 559; Lancet, 1877, IL, 604; Practitioner, XXI., 321; XXII., 241; Year Book, Pharm., 1875, 215; 1879, 5^3! Christy, Com. Pl. and Drugs, IL, 3g M., 371 IV., 20; V., 72; VI. 6; VII., 95; VIII., 85; XI., 76; Balfour, Cyclop., 1278; Smith Die, 106, Kew Report, 1878, 30; Home Dept. Cor. regarding revised Pharmacopoeia, 222, 233, 281, 305; Agri-Hort. Soc. of India, Trans., VII., 73, 74; Journals (Old Series), IV., 204; VI. 38; IX. 'Sel.), 41; Contrib. Mat. Med. and Nat. Hist., China (1871), F. P. Smith, 140.</li> <li>Habitat.—A moderate* sized evergreen glabrous tree, readily known by the hard, round, fruits, which grow on the stem and main branches. It is found from Sikkim and the Khasia mountains eastward to Chittagong, Rangoon, and Tenasserim.</li> <li>Oil.—The sEEDS yield under the hydraulic press from 25 to 30 per cent. of OIL, to ether 51*5 per cent.; the latter oil turns green with the sulphuric acid test. (Dymock.) Chaulmugra oil has long been known and used in India as a remedy for cutaneous diseases, and has lately become a drug of some importance in European practice. As obtained in the bazars, the oil is commonly very impure, and fhe means of detecting these impurities, has foi med the subject of careful investigation by Dr. Dymock. When pure, the expressed oil is clear, of a pale sherry colour, with the odour of chaulmigra, and a sp. gr. of</li></ul> |

| Chaulauran Oil                                       | GY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| Chaulmugra Oil.                                      | (?. 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| <text><text><text><text></text></text></text></text> | brown, <sup>afte</sup> TM * <sup>r</sup> £ <sup>s</sup><br>eddish-brown resin-<br>il, forms round the<br>ion takes place As<br>purposes should be<br>. Schlagdenhauffen<br>o be mixed with an<br>be evaporated until<br>owed to cool, and a<br>uce a fine greenish-<br>out by chloroform,<br>chlorophyll This<br>om 4.0° to 70° of the<br>ortion as the solution<br>a very weak solu<br>ending between 40<br><i>crn. de Pkar. et da</i><br>fr. J. Moss, F. I. C<br>Pharmaceutical Con-<br>tion, that the meltin<br>its chief constituent<br>per cent., Hypoger<br>se acids exist in com<br>the free state as wel<br>to the first mentione<br>processes employed i<br>loss in the <i>Year Boo</i><br>a nearly allied Hydma<br>the East as a remed<br><i>dwiya</i> they are short<br>heir use in leprosy ar<br>and external remed<br>OIL are both large<br>h <i>ghi.</i> They are su<br>at when applied exter<br>ment of leprosy ar<br>ses, and rheumatis<br>hree times daily, to<br>to six drops of the <i>Pha</i><br>of bthisis and scrofu<br>and external remed<br>of by Dr. R. Jor<br>f phthisis and scrofu<br>and external remed<br>of by Dr. R. Jor<br>f phthisis and scrofu<br>and external remed<br>of by Dr. R. Jor<br>f phthisis and scrofu<br>and control the the antione<br>the state as a set and<br>as a sen and the the function<br>of the function of the the<br>timent of leprosy ar<br>and external remed<br>of the prosy ar<br>and external remed<br>of the the prosy ar<br>and external remed<br>of the prosy ar<br>and the prosy of the<br>box of the prosy ar<br>and external remed<br>of the prosy ar<br>and the prosy of the prosy<br>and ars to be increasing<br>and the prosy of the prosy ar<br>and the | CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>383<br>CHEMISTRY<br>384<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CHEMISTRY<br>385<br>CH |

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| GYNOCARD             | IA Chanlmugra Oil                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <u>odorata.</u>      | Chanlmugra Oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| OQOTATA<br>MEDICINE, | an ointment prepared from the oil. The remedy is generally employed both externally and internally, and it has been recommended that patients taking the medicine should live generously, as a weakly and under-nour-<br>ished person is said to be specially liable to the bad effects of the drug, <i>vis.1</i> loss of appetite, nausea, and intestinal irritation. The oil is best ad-<br>ministered in capsules and should be taken immediately after meals, gra-<br>dually increasing the dose from 4 grains to 30, 40, or even 1 drachm, as<br>recommended in the <i>Pharmacopoeia of India</i> ; the best form of ointment<br>is one prepared with vaseline. Perhaps the most satisfactory and trust;<br>worthy results have been those obtained in the treatment of chronic ana<br>acute eczema, and other forms of skin disease.<br>A selection of the more interesting reports from the experience of Euro-<br>pean practitioners in India may be here quoted :— **<br>SFECIAL OPINIONS—S '' The oil is alterative and long-standing, no<br>improvement takes place under its use until it is persisted in for months or<br>years. It is useful in all the forms of leprosy (tubercular, anaesthetic and<br>mixed), but the first-named variety is the one which is most benefited by<br>it. The internal use of the oil should always be assisted by its external<br>application to the affected parts. If used alone externally, if proves itself<br>to strong in some cases and excoriates the tender and diseased parts, or<br>renders the ulcers irritable and painful, and I have, therefore, generally<br>if produces nausea, vomiting or looseness of bweys, it should be stopped for<br>one or two or three of the latter. It is also very useful in lepra vulga-<br>ris, soriasis, and tertiary syphilis. During the use of this oil the patient<br>may be kept on a good and nourishing diet, but prohibited from taking the<br>following articles—fish, prawn, beef, brinjal, greens, curdled milk, lime-<br>givce, and ardent spirits.<br>The oil is best taken floating on water or milk. Its dose is from 5 <sup>to 3</sup> 5<br>drops or more (gradually increased) three or four times in the 24 |
|                      | G. 385                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Localities where Gypsum occurs (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GYPSUM.                                                |
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| ful in leprosy and skin diseases." (Civil Surgeon S. M. Skircore, Moor-<br>shedabad.) "Is beneficial when used (both internally and externally) in<br>the incipient stage of anaesthetic leprosy." (Surgeon Anund Chunder<br>Mukerji, Noakhcdly*)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE.                                              |
| Structure of the Wood.—Hard, close-grained, yellow or light brown ; weight 47ft per cubic foot. Used in Chittagong for making planks and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TIMBER.<br>386                                         |
| posts.<br>Domestic Use,—The SEED-PULP is employed in Sikkim to poison fish.<br>Trade.—Dymock writes "the seeds come from Calcutta, and cost in<br>Bombay about R15 per Bengal maund of 80ft. They are collected in<br>the Lower Himálaya in December." The following report has been fur-<br>nfch^d from Chittagong, from which the great proportion of seed is obtained<br>m Calcutta. "From 1,200 to 1,500 maunds of <i>Chaulmúgra</i> seed are<br>annually exported from the Hill Tracts to the collector ate, <i>viá</i> the Karna-<br>fuli river alone. For the export <i>viá</i> the Smigu, Matamori, and Fenny<br>there are no records. The Chittagong price is R3 and the Calcutta price<br>R5 per maund." Moodeen Sheriff gives R5 per pound as the wholesale,<br>annas 6 per ounce as the bazar price of the oil. | DOMESTIC.<br>Seed-pulp.<br>387<br>TRADE.<br><b>388</b> |
| Gypsophila Vaccaria, W. & A <sub>n</sub> see Saponaria Vaccaria, Linn.; CAR-<br>[YOPHYLLEJE.<br>CNDSUM Ball Man Cool of India 114* 450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                        |
| <b>GYPSUM,</b> Ball, Man. Geol. of India, III* 450.<br>The hydrous calcium sulphate has numerous varieties of form; when occurring in an amorphous mass it is known as Gypsum, when in a more massive form it constitutes alabaster, and when in transparent crystals it is called selenite. Gypsum on being calcined loses its water of combination and is easily powdered, forming the important industrial substance, Plaster of Paris. As is well known, the addition of water to this powder causes it to become hard and compact, and at the same time slightly to expand in volume, a property which renders it invaluable for making casts or moulds.                                                                                                                                                               |                                                        |
| [Ital.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                        |
| <b>Gypsum.</b> —SELENITE, ALABASTER; GYPSE, $Fr.$ ; GYPS, $Ger_{KS}$ , GESAS,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 389                                                    |
| <b>Vern.</b> —Kulnar, kurpűra-silasit, HIUD.; Sack, KASHMIR; MarU, SPITI;<br>Sang-i-jerdhat, SALT RANGE; surma safed, JHBLUM; Cack= Plaster of<br>Paris, PB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                        |
| References.—Mallet, Geology of India, IV. (Mineralogy), 143; Baden<br>Powell, Pb. Pr., 41; Atkinson, Ec. Mineralogy, Hill Dhts., NW. P.,<br>*877> 34; Mason, Nat. Prod. Burma, 31; Burma fr its People, 588, J3S/<br>Balfour, Cyclop., /., 12]Q; Quarterly Journal of Agric, I., 119; Gazet-<br>teers:—Bombay, V., 6; Panjdb, Snafipur, 13; Rawal Pindi, II; Dis-<br>trict Man., Trickinopoly, 67, 68.                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                        |
| Occurrence.—The following short account of the chief localities in India in which Gypsum is to be found, has been compiled for the most from the article on the arbitration $P_{\rm eff}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LOCALITIES.                                            |
| part from the article on the subject in <i>Ball's Economic Geology</i> , <i>I.e.</i><br><i>MADR\S,— Trichinopoly District.—The</i> mineral is abundant in <i>many</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Madras.                                                |
| parts of the cretaceous rocks of this district, but is generally somewhat<br>impure, occurring in "concretionary masses and plates. It would answer<br>when made into plaster of Paris for taking moulds, but would not do for<br>ca~ts where whiteness is required; and seldom occurs in sufficient quantity<br>to be worth collecting, though plates of pure selenite are to be found.                                                                                                                                                                                                                                                                                                                                                                                                                                    | 390                                                    |
| Chingleput District.—Masses of gypsum and crystals of selenite occur<br>in the clayey estuarine beds to the north of Madras, but not in any great<br>abundance. According to Mr. Foote, however, supplies for use in the<br>School of Art at Madras have been obtained from this source.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                        |

*Nellorp. District.*— Crystals of greater purity than those found near Madras are said to occur in the Eastern coaRt districts, of which Nellore is one. Mr. Foote considered that they might, with profit, be collected in the neighbourhood of the canal and forwarded lo Madras.

| GYPSUM.            | Localities where Gypsum occurs.                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOCALITIES.        | BOMBAY.—Gypsum in the form of selenite is found in small quantities                                                                                        |
| Bombay.            | in the marine deposits about Bombay, and in Kathiawar, and is also said                                                                                    |
| 391                | to occur in parts of the Deccan in connection with deposits of salt. But                                                                                   |
| 571                | the principal source of Gypsum in the presidency is Cutch, where large                                                                                     |
|                    | deposits occur especially in subnummuHtic shales. Ball writes : "Although                                                                                  |
|                    | much of it might be obtained without greater trouble than picking up                                                                                       |
| . i                | the pieces, it does not appear to be utilised except to a slight exten                                                                                     |
| 1                  | by goldsmiths, who are said to use it in a powdered state for polishing their wares."                                                                      |
|                    | SIND.—Mr. Blanford states that it is found in deposits, frequently                                                                                         |
| Sind.              | 3 to 4 feet thick, near the top of the Gaj beds of the Kirthar range                                                                                       |
| 392                | Dr. Buist in 1852 drew attention to the interesting fact that the art o                                                                                    |
| 1                  | making plaster of Paris was then known to the natives of Sind, who em                                                                                      |
| 4                  | ployed it in casting lattices and open-work screens for places in which a                                                                                  |
|                    | free circulation of air was desired.                                                                                                                       |
| Rajputana.         | RAJPUTANA AND CENTRAL INDIA.—Mallet states that about seven mile                                                                                           |
| 393                | north-north-west of Na^or, in Jodhpur, a bed of gypsum, probably not les                                                                                   |
| 575                | than 5 feet thick, exists in the alluvium, which Mr. Oldham believes to hav                                                                                |
|                    | been formed in a salt lake. It is also to be found at Dakoria and Bhad                                                                                     |
| 1                  | dana. The Nagor gypsum is dug to some extent, and is used in th                                                                                            |
| 1                  | Jaipur School of Art, for coarser purposes.                                                                                                                |
| Panjab.            | THE PANJAB.— <i>Bannu District.</i> —The mineral is found in Kalabag                                                                                       |
| 394                | and in the Kahsor range but is not at present utilised.<br>Kokdt District—Contains gypsum in great abundance; Mr. Wynn                                     |
| 1                  | in fact states that there is probably more of this mineral than of the rocl                                                                                |
| 1                  | salt with which it is associated. Ball writes: "It might be obtained by                                                                                    |
|                    | open quarrying in any quantity, but it is not worked." Though the crop                                                                                     |
|                    | raised on the soil resting on an expanse of the mineral at Spina are be                                                                                    |
| ·                  | lieved by the Natives to be finer than those in any other part of th                                                                                       |
|                    | country, they do not appear to draw the natural inference, and utilise th                                                                                  |
|                    | abunr*\nt gypsum as manure.                                                                                                                                |
|                    | Salt-Range.—In the districts including these hills gypsum occurs in                                                                                        |
| 1                  | enormous quantities, associated with the salt marls of silurian or pre-silurian                                                                            |
|                    | age. When powdered it is used to mix with mortar, and some of th                                                                                           |
| Ì                  | more compact varieties near Sardi are manufactured into plates and smal                                                                                    |
|                    | ornamental articles. Selenite is said to sell at Lahore for R3-14 pe                                                                                       |
|                    | maund, the purpose for which it is used being probably medicinal. (Ball.                                                                                   |
|                    | The writer can find no record of a trade in gypsum from this extensiv                                                                                      |
| 1                  | source of the mineral, but it may be mentioned as a proof of its quality, the<br>all the plaster of Paris models sent from India to the Colonial and India |
|                    | Exhibition by Dr. Watt were made from Salt-Range gypsum. It was foun                                                                                       |
| 1                  | to be very pure, of a perfectly white colour, of admirable quality, and i                                                                                  |
|                    | every way suited for casting purposes.                                                                                                                     |
|                    | <i>Spitu</i> —Considerable deposits of gypsum are found in this valle                                                                                      |
|                    | Mr. Mallet states that he believes these deposits to be derived from therma                                                                                |
|                    | springs. Some of the mineral obtained from this locality is of snow                                                                                        |
|                    | whiteness, and apparently in every way suited for the most delicate orna                                                                                   |
|                    | mental work, or for the manufacture of the purest plaster of Paris.                                                                                        |
| NW.<br>Provinces   | NORTH-WEST PROVINCES Deposits occur in the Dehra Dún rang                                                                                                  |
| Provinces.,<br>205 | from which plaster of Paris has been made and employed with success i                                                                                      |
| 395                | the internal decoration of houses at Dehra and Mussuri. The mineral ha                                                                                     |
|                    | also been found in the Kumdon and Garhwal Districts from which, accord                                                                                     |
|                    | ing to Atkmson, good plaster of Paris has been derived. In the latte                                                                                       |
| Burma.             | $d_{15}$ rict a dark $l^{Te}l^{2}$ variety occurs which is occasionally made into saucer and bowls by the Natives.                                         |
| <b>396</b>         |                                                                                                                                                            |
| 370                | BURMA.—Available literature points to the supply in Burma being s                                                                                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ROCARPUS<br>acquini.               |
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| small that as a commercial source of gypsum it is practically useless. At<br>Kyauk Tyan and on Amherst island sparsely dessiminated crystals of<br>selenite occur, and a granular variety is said to be found on the banks of<br>the Tenasserim river.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | LOCALITIES.                        |
| Medicine.—Gypsum is considered by the Hindu's to have cooling pro-<br>perties, a gruel made from it being frequently administered in cases of<br>fever. It is kept in small quantities as a drug in most Indian bazaYs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | medicine.<br><b>397</b>            |
| Domestic and Industrial Uses.—It is occasionally burnt and used for<br>chewing with betel instead of Carbonate of Lime. It is also employed for<br>whitewashjand as a plaster; but only in one locality, <i>viz.</i> , Sind, do the natives<br>appear to understand its value for making mouldings, hard cements, &c,<br>when in the condition of Plaster of Paris. Of late years, however, the<br>knowledge of its properties and decorative uses has spread to some extent;<br>it is employed in all art schools, and there is every probability that its utili-<br>sation will increase. Should this be the case, it would seem that the<br>fypsum obtained from the Salt Range would be most likely to supply the<br>emand. As already stated, small ornamental articles are carved in a<br>few localities from certain of the harder forms of the mineral.<br>Gypsum is a valuable manure especially for leguminous crops, in the<br>ash of which it is an important constituent, <i>see</i> Manures, Vol. V. | DOMESTIC.<br>398<br>Manure.<br>399 |
| GYROCARPUS, Jacq.; Gen. PI., I., 689.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |
| <ul> <li>Gyrocarpus Jacquini, Roxb.; Fl. Br. Ind., II., 461; Bedd., Fl.<br/>[Syh.j t. 196; COMBRETACEJE</li> <li>Syn.—GYROCARPUS ASIATICUS, Willd.; G AMERICANUS, Jacq.;G. ACU-<br/>MINATUS, Meissn.; G. SPHENOPTERUSand G. RUGOSUS, R. Br.</li> <li>Vern.—Zaitun, HIND.; Tanuku manu, ponuku, kummara ponuhu,<br/>kumar pulki, TEL.; Pinlethitkauk, BURM.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 149; Kurs, For Fl. Burnt., I.,<br/>470 / Gamble, Man. Timb., 187; Elliot, Fl. Andhr., 103, 755,173 / Drury,<br/>U. PL, 239; Lisboa, U. PI. Bomb., 77; Balfour, Cyclop., /., 1280; Mysore<br/>and Coorg Gass., /., \$2,7'; Ind. Forester, 111., 202; Madras Man.<br/>of Administr.y I., 363.</li> <li>Habitat.—A tall deciduous tree common in South India up to an<br/>altitude of 1,000 feet, also in the Malay Peninsula, the Andaman Islands,<br/>and I'enasserim; rare in Bengal; distributed through the tropics of the<br/>whole world.</li> </ul>                                              | 400                                |
| Structure of the Wood.—Grey, soft, very light, weight 23ft per cubic foot. It is used in South India to make boxes and toys, and is preferred to all others for <i>catamarans</i> . <i>{Beddome.)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TIMBER.<br>401                     |
| Domestic Use.—The SEEDS are made into rosaries and necklaces.<br>{Beddome.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | DOMESTIC.<br>Seeds.<br>402         |
| -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |
| · <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
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| HAHCORE                              | Logwood \$ Hair dyeing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| dugong.                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                      | H <sup>^</sup> MATOXYLON, Linn.; Gen. PL/., 567.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| I                                    | Haematoxylon campechianum, Linn. / Bentl. & Tnm., II., S6;<br>LOGWOOD. [LEGUMINOS^.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                      | <ul> <li>Vern.—Bokkan, BENG. 5 Partanga, KAN.</li> <li>References. — Gamble, Man. Timb., t3S; Mason, Burma and Its ?%\$}**<br/>Sii, 770; Pharm. Ind., 67; O*Shaughnessy, Beng. Dispens., 3'0; Fluck.<br/>&amp; Hanb., Pfiarmacog., 213; Indian Forester, VI., 240; XIV., 29.</li> </ul>                                                                                                                                                                                                                                                                                                                                 |
|                                      | Habitat.—A small spreading tree, native of Central America and the West Indies; wood imported into India. The tree is mentioned by <b>Mason</b> as cultivated in a few gardens in Burma, where it is said to flourish as if an indigenous plant.                                                                                                                                                                                                                                                                                                                                                                        |
| DTE.<br>Heart-Wood.<br><b>2</b>      | <b>Dye.</b> —A decoction of the chips of the HEART-WOOD is used for Eyeing violet and blue, certain shades of grey, and more especially blacks, to which latter it gives a lustre and velvety cast.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MEDICINE.<br>Heart-wood.<br><b>3</b> | Medicine.—For use in medicine the hard HEART-WOOD is cut up into<br>small chips by the aid of powerful machinery. These have a feeble, sea-weed-<br>like odour, and a slightly sweet, astringent, taste. Prescribed as a decoction<br>and extract, it is a mild astringent and tonic, and is useful in chronic<br>diarrhoea, atonic dyspepsia, and infantile diarrhoea. The decoction has                                                                                                                                                                                                                               |
|                                      | been found a valuable injection in leucorrhosa. It is also said to be use-<br>ful as an ointment in cancer and hospital gangrene, in which cases it pro-<br>bably acts as a feeble antiseptic, diminishing foetor and purulent dis-<br>charges. Long-continued use has sometimes been followed by phlebitis,<br>hence caution is necessary in its employment.                                                                                                                                                                                                                                                           |
|                                      | SPECIAL OPINIONS.—§" In cases of menorrhagia, women are often treated with a decoction of log-wood; which is also used as an injection" ( <i>Surgeon-Major C. W. Caltkrop, M.D., Morar</i> ). "In cases of chronic atonic diarrhoea, I have found the decoction of log-wood a valuable addition to astringent mixtures. Its powers as a tonic are undoubted." ( <i>Sur-</i>                                                                                                                                                                                                                                             |
| chemistry.<br>4                      | <i>geon S<sub>n</sub>H. Browne, M.D., Hoshangabad, Central Provinces).</i><br>Chemical Composition.—The important part of the plant is the red<br>HEART-WOOD, which contains <i>Hcematoxylin</i> , also a volatile oil and tannic<br>acid.                                                                                                                                                                                                                                                                                                                                                                              |
| 5                                    | Haematoxylin, when pure, is nearly colourless, very soluble in hot water<br>and alcohol, but only sparingly so in cold water and ether. It is some-<br>times found crystallised in clefts of the wood. WJhen exposed to the air<br>under the influence of alkalies, it becomes red, <i>hcematein</i> being formed.                                                                                                                                                                                                                                                                                                      |
| 5                                    | Hair dyeing or staining as practised in India.<br>Ist Process*—Mix equal parts of chalk and soap and half the quantity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                      | of lime; rub in a leaden pestle and mortar until the mixture acquires a bluish colour; apply this to the hair, rubbing in; tie up the hair within a cloth for about an hour; wash; thereafter apply a paste, which has been allowed to ferment to some extent, made of wheat flour, pulverised iron filings, and yeast; tie again for another hour; wash in a strong infusion of galls or of <i>amid</i> (Phyllanthus Emblica), the latter being cheaper; there * after apply an oil to give a gloss. The colour thus obtained is very biack and perfectly fixed being readered weakers only by the growth of the hair. |
|                                      | and perfectly fixed, being rendered useless only by the growth of the hair<br>below which reveals the original colour.<br>2nd Process.—Rub henna leaves on the hair and tie for an hour<br>Wall's fi <sup>Pply</sup> thereafter a P <sup>aste</sup> of indigo or indigo leaves; wash and fix<br>t*? Sans or <i>dmld</i> . This gives a bluish black, but as the indigo becomes<br>rubbed off the henna gives the bein time a rad times                                                                                                                                                                                  |
|                                      | rubbed off, the <i>henna</i> gives the hair tips a red tinge.<br>Halicore dugong, <i>Cuv.</i> , THE INDIAN DUGONG, see Whales. ; V)1 VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                      | H. 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| Darma Flants. (J. Murruy)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ALOXYLON<br><u>ecurvum.</u>        |
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| HALOXYLON, Bunge; Gen. Pl. <sub>9</sub> III., 70.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                    |
| A genus of shrubs or small trees, having, according to the <i>Flora of British</i><br><i>India</i> , from 8 to 10 species, of which 4 are Indian; namely, H. recurvum,<br>H. Thomsoni, H. salicornicum, and H. multiflorum. Mr. Lace has,<br>however, in his collection of the CHENOPODIACE^: of Baluchistan (Quetta, Sibi,<br>&c.) added H. Griffithii, <i>Bunge</i> , and also what appears to be a new species<br>to which the name of H. Laceii may be assigned. This somewhat resembles<br>H. multiflorum, but is more slender, more profusely branched, and has large<br>pink or yellow flowers. It is known in Sibi as <i>Shordi</i> and is recognised by the<br>natives as quite distinct from H. multiflonim (the <i>land</i> ). Like the other species<br>it is eaten by camels, but in this respect H. Griffithii, <i>Bunge</i> , is much pre-<br>ferred, even <i>to pilt</i> (Salvadora olioides). (Compare with correction under<br>Cąroxylon Griffithii, <b>Vol.</b> II., 176.) |                                    |
| DIACEA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6                                  |
| HalOXylon multiflorum, Bunge; Fl. Br. bid., K, 16; CHENOPO-<br>Syn.—ANABASIS MULTIFLORA, Mog.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | , v                                |
| Vern.—Shalme, lana, TRANS-INDUS; Lana, SALT RANGE and RECHNAB<br>DOAB; Metra lana, gora lana, BARI DOAB; Dana, short lana, FEROZE-<br>PUR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |
| <b>References.</b> -Stewart, Pb. PL, 176; Baden Powell, Pb. Pr., 372; Settle-<br>ment Reports:—Panjab, Jhang, 23; Montgomery, 18, 19.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |
| Habitat.—A low shrub, from 4 to 6 inches high, of the north-western<br>Panish plains: distributed to Afghénistan and Balýchistan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | }                                  |
| Panjáb plains; distributed to Afghánistan and Balúchistan.<br>Medicine.—This species is mentioned in <i>Badtn Powell's List of Drug-</i><br><i>yielding Plants</i> , but no account is given of its properties or uses.<br>Fodder.—Camels are fond of the PLANT.<br>Domestic.—In the settlement report of the Montgomery district gora                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | MEDICINE.<br>7<br>FODDER.<br>Plant |
| <i>lana</i> , or <i>metra lana</i> (both, according to Stewart, vernacular names for H. multiflorum) are mentioned as being used in the manufacture of BARILLA or <i>Snjji-khar</i> ; but the plant referred to is probably Salsola Kali, <i>Willd</i> . (See article on BARILLA, <i>Vol. /., 3Q6.</i> ) Stewart writes, "It is used in some parts for washing clothes, and it is probably this whcJn Bel lew states to be used by women in the Peshawar valley for washing the head."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 8<br>DOMESTIC.<br>9                |
| H. recurvum, Bunge ; Fl. Br. Ind.y V., ij; Wight, Ic. <sub>%</sub> t. 1J94.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10                                 |
| Syn.—H. RECURVUM and H. STOCKSII, <i>Hook. f.</i> \ CAROXYLON RECURVUM, <i>Moq.</i> ; C. INDICUM, <i>Wight</i> ; SALSOLA STOCKSII, <i>Boiss.</i> ; S. LANA, <i>Stocks</i> ; S. RECURVA, <i>Wall.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Vern.</b> — <i>Laghme</i> , TRANS-INDUS; <i>Khar</i> , CIS-INDUS, PB.; <i>Khdri-ldni</i> or <i>kdri-ldni</i> , <b>SIND.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |
| <b>References.</b> —Stewart, Pb. Pl. <sub>M</sub> 178; Aitchison, Cat, Pb. andSindPL, 127;<br>Murray, Pi. and Drugs, Sind, 104; Settlement Reports:- Panjdb,<br>Jhang, 23; Lahore, J3; Montgomery, 18, 19; Dera Ismail Khan, 8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |
| Habitat.—A straggling bush, several feet in height, with long-spreading<br>recurved branches j found in the Western Panjáb plains and the Salt<br>Range, ascending to 2,500 feet; also in Sind, South-Western India,<br>and Burma; distributed to Afghanistan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |
| Medicine.—The PLANT is used in the manufacture of <i>Sajji-khar</i> (see article on BARILLA, <i>Vol.</i> /., 396).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MEDICINE.<br>Plant.                |
| Fodder.—It is a favourite food of camels, forming indeed their prin-<br>cipal fodder in many parts of the Panjáb and Sind. The farmers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | II<br>FODDER.                      |
| of <i>sajji</i> , however, do not allow the camel-owners to take the plants <i>gratis</i> as a jungle product. Large quantities, notwithstanding this, are said by Edgeworth to be taken into Miiltan for camel food (see Article on <i>Camel</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Plant<br>12                        |
| Fodder, Vol. II., 5*).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |
| H.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |

| HARDWICH<br>binata.      | KIA Hamiltonia; Hardwickia, a Useful Fibre;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13                       | HAMILTONIA, Roxb.; Gen. PL, II., 133.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| FODDER.                  | <ul> <li>Hamiltonia suaveolens, Roxb.; Pi. Br. Ind., III., 197; Bedd.,<br/>[Fl. Sylv. t. 77 /. 3; RUBIACEJB.</li> <li>Syn.—H. SCABRA, Don; H. MYSORENSIS, W. &amp; A.; H. PROPINQUA,<br/>Dene.; LASIANTHUS TUBIFLORUS, £/«#«?; SPERMADICTYON SUAVEOLENS,<br/>Roxb., Cor. PL; S. AZUREUM, Wall.</li> <li>Vem.—Kudia, KOL; Bainckampa, NEPAL; Padera, KUMAON; KaŋSra,<br/>puddri, phillu, musket, kantdlul/fisdu'ni, niggi, tulenni, phut, gohtnlat<br/>PB.; Mahabal, C. P.</li> <li>References.—Roxb, FL Ind., Ed. C. B. C, iS6, Hort. Beng., 1\$ / Brandts,<br/>For. FL, 278; Beddome, FL Sylv., 134', Gamble, Man. Timb., U9!<br/>Stewart, Pb. PL, irs; Rev, A. Campbell, Cat. Ec. Prod., Chutia Nag-<br/>Pore, No. 8109; Atkinson, Him. Dist., 311; Indian Forester, II., 26;<br/>HI., 203; XII., App. is; Gazetteer of Mysore and Coorg, I., 56. j*</li> <li>Habitat.—An undersnrub from 4 to 12 feet in height, with spreading<br/>branches; it occurs at altitudes from 1,000 to 5,500 feet in the Tropical<br/>and Subtropical Himalaya, from Kashmir to Bhotan, and the Salt Range;<br/>also found in Central India and the Western Peninsula, ascending to 4,000<br/>feet on dry rocky hills from Marwar and Behar southwards to Mysore.<br/>Fodder.—Buffaloes eat the LEAVES. (/?. Thompson).</li> </ul>                                                                                                                                                                                              |
| Leaves.<br>14<br>TIMBER. | Structure of the Wood.—Very small, but said by Brand is to be used<br>in Chamba to make charcoal for gunpowder.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 15                       | HARDWICKIA, Roxb.; Gen. PL, I., <sub>5</sub> 86.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 16                       | <ul> <li>Hardwickia binata, Roxb.; Fl. Br. Ind., II., 2jo; Bedd. Fl. Sylv.,<br/>[t.26; LEGUMINOS-AE.</li> <li>Vern.—Anjan, aojan, HIND.; Anjan, KOL; Chhota dundhera, GOND;<br/>Anjan, C. P.; Parsid, BOMB.; Anjan, MAR.; Bone, KURKU; Achd,<br/>atti, kat-udugu, Chita cha (the fibre), TAM.; Nar yepi, èpe, ndra tye,<br/>yapa, TEL.; Kamrd, karacho, karacki, asanagurgi, KAN.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 378; Gamble, Man. Timb., T43;<br/>, JDalz. &amp; Gibs., Bomb. FL, 83; Elliot, Flor. Andhr., 57, 129/ CfShaugk-<br/>~fiessy, Beng. Dispens., 312; Drury, U. PL, 240; Lisboa, U. PL, Bomb,<br/>64; Birdwood, Bomb. Pr., 329; Cross, Bevan, King, Rept. on Ind. Fibres,<br/>9, 53; Indian Forester, II., 18, 19; IV., 292, 322,366; VI., WS, 332;<br/>VIII., 103,106,112, 118,119,122,123,125,126, 130, 369, 376, 400, 411, 412,<br/>414, 417, 439; IX., 274, 383, 286, 4SF, 467; X., 546, 547, SS&lt;&gt;, SSr; XIII.,<br/>120, 126 f XIV., 269, 271; Spons, En cyclop., 961; Balfour, Cyclop, //.,<br/>17; Treasury of Bot., /., 569; Settlement Reports: Central Provinces,<br/>Nimar, 307; üpper Godavery Dist., 37; Chanda, App., VI; Bilas-<br/>pore, 77; Bhanaara, 19; Manual:—Madras Administration, I., 313<br/>Trichinopoly Dist., 78; Coimbatore Dist., 401; Cuddapah Dist., 262;<br/>Gazetteers.—Mysore and Coorg, I., \$* &gt; !?•* */ Bombay, XV., 70<br/>XVI., 17.</li> <li>Habitat.—A tall deciduous tree, reaching a height of 100 feet, found in</li> </ul> |
| бим.<br>17<br>ТАŊ.       | <ul> <li>Behar and the Western] Peninsula, ascending to 3,500 feet (FL Br. Ind.). Found in the dry forests of South and Central India, but not everywhere; mostly gregarious in isolated belts or patches of greater or less extent. Very commonly found on sandstone, but also met with in trap and granite. Wanting in the Western moist zone, and not found in Northern India, though present as far north as the Banda district of the North-Western Provinces. (Gamble.)</li> <li>Gum.—It yields a gum. (Gamble.) Though no definite information exists regarding this fact, it appears probable that the so-called gum may really be a form of balsamic oleo-resin resembling that abundantly obtained from the other species.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Bark.<br>18              | Tan.—In the Settlement Report of the Chanda district the BARK is said to be used for tanning.<br>H. 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| a substitute for Balsam Copaiva. (J. Murray.) HA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | RDWICKIA<br>pinnata.          |
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| Fibre.—The fibre obtained from the inner layers of the BARK is slightly<br>woolly and of a brownish colour. Chemically it ought to be a valuable<br>fibre, as it contains 63*4 per cent, of cellulose to 13*3 of water. It is strong,<br>and used in the manufacture of ropes by the natives of the forests in<br>which it abounds. Elliot, in his <i>Flora Andhrica</i> , writes, "I saw the people<br>extracting the fibre in considerable quantities and employing it as cordage,<br>without further preparation, in the island of Sivasamudram." It is also<br>a very useful paper-making material, but it would not, at the present rates<br>of freight, pay to send it to England for that purpose.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FIBRE.<br>Bark.<br>19         |
| Fodder.—The LEAVES are given as fodder to cattle, and, owing to this,<br>fine trees are often so much lopped as to be destroyed. Beddome re-<br>ferring to this subject, in his <i>Flora Sylvatica of Southern India</i> , writes,<br>"It is naturally of straight growth, but, cattle being very fond of its<br>leaves, it is pollarded to a frightful extent wherever it grows. It is heart-<br>rending to see the damage done in the Cauvery Forests."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Leaves. <b>20</b>             |
| Structure of the Wood.—Sapwood small, white; heartwood extremely<br>hard, dark red, often with a purplish tinge, and very close-grained; weight<br>about 82ft per cubic foot. This wood, perhaps the hardest and heaviest<br>in India, is extremely durable and does not warp, though it has a tend-<br>ency to split. It is used for bridge and house posts and for ornamental<br>work. It has been recommended for sleepers but is probably too hard,<br>heavy, and difficult to work to be much in favour. <i>{Gamble.)</i> At the<br>Dehri workshops it has been used instead of brass for bearings of machi-<br>nery, and has been found to wear well. In the Sone River piles of <i>anjan</i><br>have been found after twenty years as sound as when first put in. It is<br>much used for building purposes, also for making carts and agricultural<br>implements in the districts where it occurs; but, owing to its hardness and<br>weight, it is difficulty bring to market. The shoots grow very straight,<br>and are hence valuable as rafters.                                                                                                                                                                                                            |                               |
| <ul> <li>rlardwickia pinnata, Roxb.; Fl. Br. Ind., II., 270; Bedd., Fl. Sylv!, Vern.—Matty en samprdni, TRAVANCORE; Koldvu, TINNEVEJ i.t; Yenne, MANJARABAD.</li> <li>References.—Roxb., Fl. Ind., Ed. C. B. C, 378; Gamble, Man. Timb., '43; Dymock, Mat. Med. W. Ind., 287 (under heading of H. binata); Fluck. &amp; Hanb., Pharmacog., 232; Cooke, Gums and Gum-resins, 116; Atkinson, Gums and Gum-resins, 34'/ Indian Forester, III., 22, 23,24; VIII. 415; Spons, Encyclop., 1640, 1654; Balfour, Cyclop., II., ij; Treasury of Bot., I., 50p; Gazetteer, Mysore and Coorg, /., 52.</li> <li>Habitat.—A very large tree of the Gha'ts of Kandra, Travancore, and the Karnatic</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 22                            |
| the Karnatic.<br>Balsamic Oleo-Resin.—An oleoresin of a dark red colour is obtained by<br>deep incision into the heart of the tree. In properties and chemical composi-<br>tion it much resembles the wood oil obtained from species of Dipterocarpus,<br>and the balsam of Copaiva (see articleson D. turbinatus, Vol. III., 161).<br>In Beddome's Flora Sylvatica, the following report on the analysis of<br>the balsam by Mr. Broughton is given:—"The substance appears on<br>examination to consist of a solution of certain chemically different resins<br>in an essential oil, and is in fact an oleo-resin. Like the wood-oils<br>from the different species of Dipterocarpus, it greatly resembles both in<br>composition and properties the Copaiva balsam, though it lacks the<br>transparency and light yellow colour of the latter. It is nearly entirely<br>soluble in ammonia, but does not produce a clear solution. The essential<br>oil has the same composition as that from Copaiva balsam. It boils (on<br>the Nilghiris) at a temperature of 225°C. It rotates the plane of polari-<br>zation to the left, but to a different degree from that found with the oil of<br>Copaiva. This essential oil occurs in different amounts in the balsam, | BALSAMIC<br>OLEO-RESIN.<br>23 |
| Н. 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                               |
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| HARES.                                              | Indian Hares.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| HARES.<br>BALSAM.<br>MEDICINE.<br>Oleo-resin.<br>2+ | Indian Hares.<br>and more abundantly in the fresher collected specimens \$ these are quite<br>fluid, but other specimens are almost semi-solid, doubtless owing to the<br>evaporation and oxidation of the oil. The oil is best obtained by pro-<br>longed distillation of the balsam with water. By this means I have<br>obtained, from an apparently old specimen of balsam, 25 per cent, of oil,<br>and in the most recently collected specimens, I have found over 40<br>per cent. I have made many attempts but have not obtained any crys-<br>tals of copaivic acid from the balsam. The solid resins are of an acid<br>character, but the balsam does not solidify so strongly as that of copaiva<br>after being heated with magnesia. The oil can be separated from the<br>balsam by Ader's process, but it is obtained in a very impure and<br>coloured state." The authors of the <i>Pkarmacographia</i> describe this oleo-<br>resin as a thick viscid fluid, which, owing to its intense tint, looks black<br>when seen in bulk by reflected light, though it is perfectly transparent.<br>It is dichromic by transmitted light, in a thin layer appearing yellowish<br>green, in a thick layer vinous red.<br>Medicine.—The OLEO-RESIN forms an efficient substitute for copaiva,<br>being useful in gonorrhoea and catarrhal conditions of the genito-urinary<br>and respiratory tracts.<br>Dr. Dymock, in his <i>Materia Medico, of Western India</i> , probably in-<br>advertently quotes the <i>Pharmacographia</i> account of the oleo-resin in <i>Bed-<br/>dome's Flora Sylvatica</i> , writes, "There appears little doubt that this<br>balsam could effectually substitute copaiva balsam in medicine. But the<br>appearance of the specimens that 1 have received is greatly inferior to the<br>latter, and they could not, certainly under present circumstances, com-<br>pete with the Brazilian balsam in the European market." It appears,<br>however, that this balsam has by no means attracted the attention that it<br>deserves; indeed, mention of it seems to have been made only in two out of |
| •                                                   | the numerous list of works which treat of Indian Materia Medica. It is<br>doubtfUV, however, whether the oleo-resin or the essential oil obtained from<br>it could be manufactured and exported with profit; still there is no doubt<br>of its valuable properties, and it is probable that, in India at least, it might<br>become an efficient and economical substitute for copaiva balsam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| TIMBER,                                             | Structure of the Wood.—Sapwood large; heartwood brown; weight 4.7ft per cubic foot; used, in the neighbourhoods in which it abounds, for building purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 26                                                  | HARES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                     | The animals so known constitute the family Leporidse of the Natural Order RODENTIA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                     | The family is divided into two genera—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                     | <ul><li>z. Lēpus, or true hares.</li><li>2. Lagomys, or mouse hares.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                     | The family is generally distributed over the world except in Austra-<br>lasia, and many species are met with in India, more especially in the<br>hills on the borders of Tibet, Afghanistan, and Baluchistan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                     | References,—Jerdon, Mammals of India, 223; Blanford, Scientific<br>Results of the Second Ydrkand Mission, Mammalia, 60 / Blanford,<br>eastern Persia, II., 8r; Blytk, Cat. Mam. and Birds of Burma, 43}<br>Murray, Vertebrate Zoology of Sind, 49; Sterndale, Mammals of /nd.,<br>30 <sup>*</sup> t Forbes Watson, Indust. Surv. of Ind., 327, 382; Balfour, Cyclop.,<br>17., 704; Spons, Cyclop., 1031.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

H. 26

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| Indian Hares. (J. Mut                                                                                                                                                      | rray!) HARES.     |
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| Lepus, <i>Linn</i> .<br>The species of this genus found in India and the adjoining co                                                                                      | untries 27        |
| (the furs of which are utilised or brought into this country) are<br>1. Lepus craspedotis, W. Blanf.                                                                       | e:                |
| THE LARGE-EARED HARE.<br>A native of Balúchistan, described and named by Mr. Blant<br>Eastern Persia* vol. II., p. 81.                                                     | ford in 28        |
| 2. L. hypsibius, W. Blanf.<br>THE MOUNTAIN HARE.<br>Habitat—Found during the Second Yarkand Mission in No.                                                                 | orthern 29        |
| Ladakh.                                                                                                                                                                    |                   |
| 3. L. hispidus, <i>Pearson</i> .<br>"> THE HISPID HARE; THE BLACK RABBIT.                                                                                                  | 30                |
| Habitat.—A rabbit-like hare, of the Himálayan Terai from C<br>pur to Assam, extending south to Dacca, probably still further, eve<br>said to the Rajmahal hills. (Jerdon). |                   |
| 4. L. nigricollis, F. Cuv.<br>THE BLACK-NAPED HARE.                                                                                                                        | 31                |
| Vern.—Khargosh, HIND. ; Sassa, MAR. ; Mfcal, TAM. ; K&ndth<br>Malta, KAN. ; Haha, SING.                                                                                    | <i>i</i> , TEL. ; |
| Habitat.—Southern India and Ceylon ; said also to occur in Si<br>the Panj£b, but according to Jerdon this statement requires confir                                        | nd and<br>mation. |
| 5. L. pallipes, <i>Hodgson</i> .<br>THE PALE-FOOTED HARE.<br>Vern.— <i>Togh, toshkhen</i> , YARKANDI.<br>Habitat Verland Tibat                                             | 32                |
| Habitat.—Yarkand, Tibet.<br>6. L. pamirensis, <i>IV. Blanf.</i>                                                                                                            | 33                |
| THE PAMIR HARE.<br>Habitat Described by Blanford as found near Lake Sirikal in                                                                                             | Pamir.            |
| 7. L. peguensis, <i>Blyth.</i><br>THE PEGU HARE.                                                                                                                           | 34                |
| Vern.— <i>Yung</i> , BURM.<br>Habitat,—A hare much resembling H. ruficaudatus, but with                                                                                    | the tail          |
| black above; found in Pegu, inhabiting the open country within or the range of forests. (Blyth).                                                                           |                   |
| 8. L. ruficaudatus, <i>Geoff.</i><br>THE COMMON INDIAN HARE.                                                                                                               | 35                |
| Vern. — Khargosh, lamma, HIND, J Kharra, sasra, BBNG.; Molol,                                                                                                              | GOND. ;           |
| <i>Kharra,</i> C. P.<br>Habitat.—From the foot of the Himálaya, southwards to the<br>very on the east, and on the west as far as the Taptí at least,                       |                   |
| further, extending from the Panjab to Assam. It is also suppose                                                                                                            |                   |
| found in Afghanistan.<br>9. L. stoliczkanus, <i>W. Blanf.</i>                                                                                                              | <u> </u>          |
| Habitat.—A spécies closely allied to L. pamirensis, found in the Silan range, north and north-west of Káshgar, by Dr. Stoliczka.                                           | e 1 nian          |
| 10. L. tibetanus, <i>Vipne</i> , <i>Water house</i> .<br>THE TIBET HARE.                                                                                                   | 37                |
| Habitat.—Little Tibet and Ladakh.                                                                                                                                          |                   |
| 11. L. yarkandensis, <i>Günther</i> .<br>THE YARKAND HARE.                                                                                                                 | 38                |
| Vern.— <i>Toshkhan</i> , YARKANDI<br>Habitat.—The plains of Ydrkand and Kishgar.                                                                                           |                   |
|                                                                                                                                                                            | <b>H. 38</b>      |

| HARES.      | Indian Hares.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| FOOD.<br>39 | Food.—All the species of Lepus are probably used as articles of Ifood,<br>but they are as a rule dry and tasteless, and by no means so good for,<br>the table as the European hare. In his list of "Mammals used for Food<br>in the <i>Industrial Survey of India</i> , Dr. Forbes Watson mentions Lepus<br>nigricollis, L. pallipes, L. peguensis, and L. ruficaudatus. Of these L.<br>nigricollis is generally considered the best, one writer describing it as<br>"nearly, if not quite, equal to the English hare in flavour." |
| FUP.<br>40  | Domestic—The FUR is valuable in trade, being used largely for linings,<br>cloaks, &c, also in the manufacture of felt for hats. Referring to the<br>latter use, the author of the article "Hare" in <i>Spons' Encyclopedia</i><br>writes: "It is about the best hair for hat-maker's purposes." In his list<br>of "Furs and Fur-bearing Mammals" Dr. Forbes Watson gives only<br>Lepus nigricollis, L. pallipes, and L. ruficaudatus, but the other species<br>found in Thibet and YaVkand are doubtless equally valuable.         |
| 4 <b>I</b>  | Lagomys, Cuv.<br>THE PIKAS, OR MOUSE-HARES.<br>A genus of small and robust animals, short-eared and tailless, referred by<br>Jerdon to the family of Leporidae or Hares, but separated by Blanford,<br>in his account of the Mammalia of the second Yarkand Mission, as a distinct<br>family, Lagomyids. It is convenient for the purposes of this work to con-<br>sider them under Jerdon's classification as Hares. The species are: —                                                                                           |
| 42          | 1. Lagomys auritus, W. Blanf.<br>Habitat.—A species differing from L. roylei in having much longe<br>ears and a lighter colour. Found on the Panong lake, but probably als<br>a native of other parts of Laddkh.                                                                                                                                                                                                                                                                                                                   |
| 43          | 2. L. curzonis, <i>Hodgson</i> ,<br>Vem.— <i>Phise-karin</i> , KoRZAK.<br>Habitat.—The higher ranges of the Himálaya from 14,000 to 19,00<br>feet. It has been found in Laddkh and Sikkim.                                                                                                                                                                                                                                                                                                                                         |
| 44          | 3. L. eriseus, <i>W. Blanf.</i><br>Habhat.—Resembles L. auritus, but amongst other differences ha<br>longer and softer hair, of a grey colour. Found in the Kuenlun Range i<br>Yarkand, south of the Sunju pass.                                                                                                                                                                                                                                                                                                                   |
| 45          | 4. L. ladacensis, <i>Günther</i> .<br>THE LADAKH PIKA.<br>Vern.—Zabra, karin, phise karin, LADAKH.<br>Habitat.—A species found in the high plateaux of Lddakh, with a fu<br>and very soft fur, and separated by Blanford from L. curzoniae, wi<br>which it was formerly supposed to be identical.                                                                                                                                                                                                                                  |
| 46          | 5. L. macrotis, <i>Günther</i> .<br>Retained by Blanford as a distinct species, though he is strongly d<br>posed to suspect that L. auritus is the summer, and L. macrotis, t<br>winter, form of the same species. First described by GUnther, found<br>the Second Yarkand Mission, at a place called Duba on the north side<br>the Kuenlun.                                                                                                                                                                                       |
| 47          | 6. L. roylei, Ogilby.<br>THE HIMALAYAN MOUSE-HARE.<br>Vern.—Rang-rünt, or rang-düni, KUNAWAR.<br>Habitat.—The Himalaya from Kashmir to Sikkim. The species w<br>first made known through a specimen obtained by Royle from the Ch<br>Mountain, near Simla.                                                                                                                                                                                                                                                                         |
| <b>4</b> 8  | 7. L. rufescens, <i>Gray</i> .<br>Habitat.—Afghanistan and Persia.<br>H. 48                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Hartshorn; Iv                                                                                                                                                                                                                                                                                                                                                                                              | у,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (J. Murray.)                                                                                                             | HEDERA                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Several other species have been describ<br>have been referred by Blanford to one or oth<br>Domestic Use.—Dr. Forbes Watson me<br>bably the only species known to him, as yiel<br>bable, however, from the descriptions of the<br>they also may be of value.                                                                                                                                                | her of the about the bound of the second sec | ove species.<br>mys roylei, pro-<br>FUR. It is pro-                                                                      | DOMESTIC.<br>Fur.<br><b>49</b>                                                        |
| Hariali Grass, see Cynodon Dactylon, Per.                                                                                                                                                                                                                                                                                                                                                                  | s., Vol. <b>II.,</b> 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 578.                                                                                                                     | }                                                                                     |
| Haricot Bean, see Dolichos Lablab, Vol. III.                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                          | }                                                                                     |
| Haritaki Nut, see Terminalia Chebula, Vo                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | , , ,                                                                                                                    |                                                                                       |
| Hartshorn.                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                          | 50                                                                                    |
| VemSabarsinghad&, Guj.; Swarsingh,<br>Medicine.—The ANTLER of the deer, inc<br>used in painful affections of the heart, pleuro<br>It is given in doses of about twenty-two grain<br>Dutt.) In former times hartshorn was used<br>monia (see Ammonic chloride, Vol. I., 219<br>consult Horns).                                                                                                              | cinerated in<br>odynia, sciations<br>is with clarifi<br>for the ma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | closed vessels, is<br>ca, and lumbago.<br>ed butter. (U. C.<br>nufacture of am-                                          | MEDICINE.<br>Antler.<br>51                                                            |
| Hawthorn, see Crataegus, Vol. II., 583.                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                          | -                                                                                     |
| <b>Hay</b> and I Hay-making, see Fodder, Vol. I                                                                                                                                                                                                                                                                                                                                                            | II., 407; als                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | o in Appendix.                                                                                                           | ]                                                                                     |
| Hazel Nut, see Corylus, Vol. II., 574.                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                          |                                                                                       |
| HEDERA, Linn. / Gen. 1                                                                                                                                                                                                                                                                                                                                                                                     | PI I 946.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                          |                                                                                       |
| A genus of shrubs, which climb extensively of<br>species, of which one is found in all the temperat<br>The generic name HEDERA is probably derived to<br>nifying a cord, while the English, Ivy, is from <i>iw</i> ,<br>age, meaning green.                                                                                                                                                                | n small trees,<br>e regions of the<br>from a Celtic w                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | he Old World.<br>ord <i>hedra</i> , sig-                                                                                 |                                                                                       |
| Hedera Helix, Linn.; FL Br. Ind., IL <sub>9</sub> J.<br>THE IVY.                                                                                                                                                                                                                                                                                                                                           | 39; ARALIAO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ĩ                                                                                                                        | 52                                                                                    |
| Vern,—Dudela, NEPAL ; Lahlab, BEHAK ;<br>UM), Kurol (CHENAB), Kurt, karir (R<br>Karbaru, katiitiri, kadloli (SUTLEJ), Ba<br>PUSHTU ; Karmora, mandia, KASHMIR                                                                                                                                                                                                                                              | AVI), Brumbra<br>AVI), KUMAO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | um dakdri (BEAS),                                                                                                        |                                                                                       |
| References.—Brandts, For. Fl., 248; Gar<br>Pb. Pl., 110; also, Tour in Hazara<br>Jnurn. (Old Series), XIV., 31; Irvin<br>kinson, Him. Dist., 311; Birdwood, Bo<br>Its People, 434, 742; Indian Forester,<br>30; Smith, Die, 224; Gazetteer:—Mysore<br>Dist., 69; Bannu, 23; Dera Ismail Kho                                                                                                                | and Khdgdn,<br>ve, Mat. Mea<br>mb. Pr., 44;<br>XIII, 68; Bay<br>e and Coorg,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Agri. Hort. Soc.<br>l Patna, 63; At-<br>Mason, Burma &<br>four, Cyclop., II.,                                            |                                                                                       |
| Habitat.—A large woody climber cf the<br>6,000 to 10,000 feet, and of the Khasia Hills,<br># Medicine.—The Ivy was at one time high<br>now almost completely discarded. Dr. Irvi<br><i>Medica of Patna</i> , remarks, "Ivy LEAVES are<br>the BERRIES to purge." "<br>Food and Fodder.—Dr. Stewart writes: "<br>food of goats, and in Kulu the LEAVES are<br>of the country to make it strong." Its BERRIES | Himalaya, a<br>from 4,000 to<br>ly valued in<br>ine, however,<br>e used to stin<br>' It is stated<br>said to be ad                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | b 6,000 feet.<br>medicine, but is<br>in his <i>Materia</i><br>nulate sores, and<br>to be a favourite<br>dded to the beer | MEDICINE.<br>Leaves.<br>54<br>FOOD &<br>FOOD &<br>FOOD &<br>Leaves.<br>55<br>Berries. |
| birds.<br>Structure of the Wood.—White, soft, porce<br>foot.                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                                                                                                                        | TIMBER.<br>57                                                                         |

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| HEDYCHIU       | JM. Hedges and Fences.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| FEDYCHIU<br>58 | <ul> <li>Hedges &amp; FenCes—LIST OF WOODY PLANTS USED FOR—</li> <li>For fuller particulars on this subject consult Cleghorn's Forests and Gardens of India, pp* 201—2//.</li> <li>Agave americana and vivipara (extensively employed for railway hedges throughout India).</li> <li>Acacia—various species, especially Farnesiana (cut down and used as dry fences).</li> <li>Bambusa—various species of Bamboo are grown as hedges.</li> <li>Bauhinia racemosa.</li> <li>Cactus and Opuntia species (used in Madras and the hotter parts of India).</li> <li>Cssalpinia sepiaria, Sappan and Bonducella.</li> <li>Carissa Carandas and spinarium.</li> <li>Caparis (various species used in Upper India).</li> <li>Dodonea viscosa.</li> <li>Erythrina indica (grown in hedges).</li> <li>Euphorbia Royleana (frequent on the lower hills).</li> <li>E. Tirucalli 'in the plains).</li> <li>Grewia multifiora and G. oppositifolia.</li> <li>Helicteres Isora.</li> <li>Hibiscus (various species).</li> <li>Hippophx rhamnoides (on the higher Himalaya).</li> <li>Hypericum Hookerianum.</li> <li>Jatropha Curcas.</li> <li>J. glandulifera (extremely abundant in Bengal).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| r              | <ul> <li>in Bengal).</li> <li>Pithecolobium dulce.</li> <li>Polyaltmatongifolia (sown thick, is used as a hedge in Calcutta, and for a source of the base of the b</li></ul> |
|                | Zizyphus-various species both as hedges and dry fences.<br>HEDYCHIUM, Keen.; Gen. PL, III., 642.<br>T., <sup>A</sup> ,/ <sup>enus</sup> of plants belonging to the Natural Order SCITAMINE.*, in the<br>iriDe ^iNGBERKiE, which comprises about 28 Indian species, of which one is im-<br>fillSi <sup>e</sup> <sup>a</sup> <sup>C</sup> <sup>G</sup> <sup>G</sup> <sup>T</sup> <sup>Icany</sup> , whilesoft; of the others are much cultivated as garden<br>CHJIS Or <sup>known as</sup> GARLAND FLOWERS. The finest of these is HEDY-<br>CHá^Sh <sup>-1</sup> <sup>o</sup> " «E <sup>UM&gt; of which</sup> Roxburgh wrote : "This to me is the most<br>SeaUen* tK <sup>a</sup> <sup>?</sup> <sup>P1a</sup> . ntsof this Natural Order that I have met with; the<br>fmmntT5 <sup>c</sup> L <sup></sup> . <sup>Ime</sup> <sup>it</sup> <sup>c</sup> ? <sup>ntinue</sup> s to throw out a profusion of large, beautiful,<br>"fragrant blossoms, makes it particularly desirable/"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| Kapur-káchri. (                                                                                                                                            | <b>7.</b> Murray,)                      | HEDYCHIUM<br>spicatum. |
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|                                                                                                                                                            |                                         |                        |
| Hedychium spicatum, Ham.; SCITAMINE*.                                                                                                                      |                                         | 59                     |
| THE LESSER GALANGAL of Ainslie, according                                                                                                                  |                                         |                        |
| of other Authors; see Alpinia officinarum,                                                                                                                 | Hance, Vol.                             | <b>I.</b> 9            |
| 195.                                                                                                                                                       |                                         |                        |
| Vern.—Sit-ruti, kapur kachri, HIND.; Kachur-kacha<br>haldi, NW.P.; Kachur-kachu, ban kela, sdki, ban<br>sheduriy {Bazar root)=kapur kachri, kachttr, PB.   | haldi, Ichor, sha<br>: Sir. sutti. BO   | ılwi,<br>MB.:          |
| Kapur krachari, MAR., Guz.; Shimai-kich-chilik ki<br>pur akdc kali, SANS.                                                                                  | shangu, TAM.;                           | Ka-                    |
| References.—Stewart, Pb. Pl., 239; Pharm. Ind.,<br>Ind., I., 140; O'Shaughnessy, Beng. Dispens., 652,-<br>W. Ind., 2nd Ed., 780; S. Arjun, Bomb. Drugs, 14 | Dytnock, Mat. 1                         | Med.                   |
| % 142; Irvine, Mat. Med., Patna, 48; Atkinson Hi<br>Birdwood, Bomb. Pr., 87; Royle, III. Him. Bot.,I.,<br>Tans, NW. P., 38; Liotard, Dyes, App., Ill,      | m. Dist 738. °                          | 774:                   |
| Ians, NW. P., 38; Liotard, Dyes, App., Ill,<br>II., 30.<br>Habitat.—Common in parts of the Panjdb Himala                                                   |                                         |                        |
| an altitude of from 3,500 to 7,500 feet.                                                                                                                   |                                         | ·                      |
| Dye.—The aromatic ROOT-STOCKS are often used                                                                                                               |                                         |                        |
| dyeing, to impart a pleasant smell to the fabric, and an                                                                                                   |                                         | oyea co                |
| along with <i>henna</i> dye (Lawsonia alba) in preparing the the North-West Provinces as <i>Malagiri</i> . They are s                                      |                                         | u mij                  |
| with the yellow root-stocks of Curcuma aromatica, Salisl                                                                                                   |                                         |                        |
| ^55') In the bazars these root-stocks are known as Kapia                                                                                                   | r-kachri, or ka                         | chúr.                  |
| Medicine.—Kapúr-kachri is found in the drug-shops                                                                                                          |                                         |                        |
| varying in thickness, and from \$ inch in diameter to a                                                                                                    |                                         |                        |
| These slices are starchy, white internally, reddish brow<br>a strongly aromatic odour, and a pungent, bitter tas                                           |                                         |                        |
| varieties, the Indian and Chinese, the latter of which                                                                                                     |                                         |                        |
| and less pungent. By the Natives they are much used                                                                                                        |                                         |                        |
| minative, tonic, and stimulant medicines. Kapur-kach                                                                                                       |                                         |                        |
| but it is mentioned in the Indian Pharmacopoeia.                                                                                                           |                                         | aden                   |
| Powell, it is principally employed in veterinary medicin                                                                                                   |                                         |                        |
| Royle considered the lesser Galangal of Ainslie to                                                                                                         |                                         |                        |
| apparently incorrectly. The description, properties, an<br>in the <i>Materia Indica</i> seem to point to Ainslie's plant                                   |                                         |                        |
| Galangal—Alpinia officinarum. The medicinal uses o                                                                                                         |                                         |                        |
| ever, very similar, and indeed considerable confus                                                                                                         |                                         |                        |
| existed in the species of Curcuma, Alpinia, Amomur                                                                                                         |                                         |                        |
| The reader is referred for further information to th                                                                                                       |                                         |                        |
| genera in Vols. I. and II.                                                                                                                                 |                                         |                        |
| Domestic and Sacred Uses.—Kapúr-kachri is the pr                                                                                                           |                                         |                        |
| the three kinds of ABIR or scented powder used as a p                                                                                                      |                                         |                        |
| Hindus in their religious ceremonies. It is said al from the attacks of insects. In Garhwál it is employe                                                  |                                         | Cioui Ahir             |
| married. Madden affirms that the pounded ROOT                                                                                                              |                                         |                        |
| hookah with tobacco. The LEAVES (sheduri—Simla) an                                                                                                         | re twisted and                          | made Root,             |
| into mats which constitute the chief sleeping mats used                                                                                                    |                                         |                        |
| * SPECIAL OPINIONS.—§"Is used in cooking : when                                                                                                            | meat is toug                            | h, or Leaves.          |
| when <i>ddl</i> does not easily break up, a piece of the dri                                                                                               | ed fruit is put                         | in the <b>C</b>        |
| degchu Is known as kachri in the Lower Panjd                                                                                                               |                                         | <i>Major</i>           |
| C. W. Calthrop, M.D., Morar). A large quantity is im<br>from China; it is chiefly used as a perfume and in                                                 | porteu IIIto Bo<br>making <i>ahir '</i> | mbay ;<br>' (Dr        |
| Dymockj Bombay).                                                                                                                                           | making uvu                              |                        |
| Trade.—As mentioned above, two forms are sold in                                                                                                           | n India. one of                         | home                   |
| production, the other imported from China. Accordin                                                                                                        |                                         | he lat.                |
| ter reaches India via Singapore, while the former is                                                                                                       |                                         |                        |

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H. 65

| HEDYOTIS                      | A green Bye.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| capitellata.                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| , TRADE.                      | from Kumaon. The Indian variety is the more valuable, fetching R5 <sup>*</sup><br>maund of 37 <sup>^</sup> , while the Chinese only sells for R4I. Since the plani<br>is immensely abundant on the Western Himálaya, as, for example, inta<br>immediate vicinity of Simla, it is somewhat surprising that the admitteoi <sup>^</sup><br>inferior Chinese root should be imported at all. Sir Edward Buck, in n<br>Dyes and Tans of the North-West Provinces, gives the export from Kumaon<br>in 1875.76 as 054 cwt., and also states that in the same year 95 <sup>*</sup> cwt. was<br>exported from Garhwal and 40k from the Bijnor District. In <sup>*</sup><br>Trade Report 25 maunds are given as the annual export via resnaw<br>to Afghanistan.                                                                                       |
| Ì                             | HEDYOTIS, <i>Linn.; Gen. PL, II., 56, 1228.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                               | A genus of herbs, undershrubs, or shrubs, of the Natural Order <sup>R U B L</sup> ; 2 <sup>3,4</sup> ,<br>comprising about 80 species, chiefly natives of Tropical Asia. Of these so<br>57 are Indian, but few are of known economic value. The famous dye;-proauc<br>the <i>Chay-root</i> of Madras, was until recently supposed to be derived iroi<br>Hedyotis umbellate, but this has now been reduced to Oldenlandxa um-<br>bellate.                                                                                                                                                                                                                                                                                                                                                                                                    |
| 66                            | Hedyotis Auricularia, Linn.; Fl. Br. Ind., Ill., s&; Bedd, Ic. Pl.<br>[Ind. Or.,t. 27; RUBIACE#.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                               | Syn.—H. NERVOSA, Wall,; H. PROCUMBENS, Wall.; H. LINEATA, Wall.<br>not of Roxb. / H. COSTATA, Br.; H. MULTICAULIS, Schldl.; *{v*EN959!<br>Korth.; M ETA BOLUS VKNOSUS, Bl.; SPERMACOCE HISPIDA, Miq*i <sup>m</sup><br>LINEATA, Roxb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| FOOD.<br>Leaves.<br><b>67</b> | Vern.—Gatta-colla, SING.<br>References.—Roxb., Fl. Ind., Ed. C.B.C., 122,124; Rheede, Hart. $M_{*}^{m'}?^{\partial m}$<br>$X_{*}$ , 32; En. PI. ZeyU 142; Bombay Gazetteer {Kdnara}, X V^V<br>HabitetEastern Bengal from Nepál, Sikkim, and the KhasiaMoun.<br>tains to Assam, Chittagong, Manipur, Burma, and southward to Maiwd<br>also a native of the Western Peninsula, from Kandra southwards, an<br>abu9\iant in Ceylon.<br>Food.—According to the account in the Enumeratio Plantarum<br>lanice, "the LEAVES are boiled, after being cut very small, and eaten<br>the Cinghalese with their rice."                                                                                                                                                                                                                                  |
| 63                            | H. capitellata, Wall.; Fl. Br. Ind., 77/., 5*-<br>Syn.—HEDYOTIS FINLAYSONIA, Wall.; OLDENLANDIA RUBIOIDES, Mig.<br>Vera.—Bakrelara, PAHARIA; Kalhenyok, LEPCHA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                               | References^^ in Journ. As. Sac., '877, //- '35 <£*jyj.701,<br>Gamble, Trees, Shrubs, &c, ofDarjilmg, 48; McCann, Dyes and fans<br>Habitet-i'nfhe Flora of British India it is . • ^ M ^ p * » * '' *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ·                             | occurs only in the Malay Peninsula from Tenassenm to Malacca. Gamble<br>includes it in his <i>List of Trees</i> , <i>&amp;c, of the Darjeehng District</i> . This seems<br>to require confirmation, however, especially as he describes the plant.as "a<br>soft-wooded climber of the Terai." According to Watt ( <i>Cal. Exhib. Cat</i> ,<br>it is plentiful upon the Burma-Manipur frontier, which may be its mos<br>westerly habitat, but it is quite herbaceous, with hollow stems, and excep<br>in the root or the portion of the stem immediately above ground, does? no<br>possess anything that could be called <i>wood</i> ; the stems are in fact hollow<br>It is probable that Gamble refers to H. scandens, <i>Roxb.</i> , a climber of th<br>tropical and sub-tropical Himalaya to the Khasia Hills, Chittagong, and<br>Burma. |
| DYE.<br>Leaves.               | Dye.—Gamble, speaking of the plant referred by him to H. capitellata <i>Wall.</i> , says that •• it is used by the Lepchas as a green dye," and that <sup>t</sup> « th                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>69</b>                     | green LEAVES are put into water and infused, and the cloth to be dyed steeped<br>in the infusion." Mr. Gamble also states that the Paharias employ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| • The Sunflower, (7. Murray.) HEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | IANTHUS<br>nuus.             |
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| mixed with the leaves of Luculia as a blue dye, but he expresses his opinion<br>that it is of value more as a mordant than a real dye. Dr. Q. Watt,<br>however, in the Calcutta Exhibition Catalogue, remarks: "I found no<br>trace of the use of either species (H. capitellata and H. scandens) as a blue<br>dye among the Nagas; although both plants are very plentiful, the Nagas<br>regularly import from Manipur and Assam the <i>room</i> dye (Strobilanthes<br>flaccidifolius)." Dr. Schlich says of H. capitellata, <i>Wall</i> .: "The Lep-<br>chas grind up the green leaves and steep the article to be dyed in the<br>infusion." "It yields a <i>green</i> dye."<br>From the preceding remarks, as also those under Baccaurea sapida,<br>(Vol. I., 362) it is clear that there must be some mistake regarding this dye-<br>stuff, and it therefore seems highly desirable that the whole subject should<br>be re-investigated. Definite information is wanting as to the actual species<br>of Hedyotis used by the Lepchas, as to whether it be used as a true dye<br>or as a mordant, and as to the plant mixed with it (if any) to produce the | DYE.                         |
| green colour.<br>Food.—Gamble, in his account of the plant referred by him to H. capi-<br>tellata, Wall., writes : "The LEAVES are eaten by Lepchas."<br>Hedyotis nitida, Wight. & Arn., Ft. Br. Ind., III., 61; Bedd., Ic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | FOOD.<br>Leaves.<br>70<br>71 |
| Syn.—H. NEESIANA, Am.; H. GLABELLA, Br. [PL Ind. Or., t. 36.<br>Vem.—Pittasud&pala, SING.<br>References.—Thwaites, En. PI. Zeyl., 142; Bombay Gazetteer (Kandra),<br>XV. <sub>t</sub> 435. ,, ^<br>Habitat.—Western Peninsula from Dharwar southwards to Travancore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FOOD.                        |
| and Ceylon.<br>Food.—" The LEAVES of this plant are finely chopped up, boiled, and<br>eaten with rice, by the Cinghalese." ( <i>Thwaites</i> ).<br>H, timbellata, <i>Wall.</i> , see Oldenlandia umbellata, <i>Linn</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Leaves.                      |
| HEDYSARUM, Linn.; Gen. PL, /., 5/0.<br>A genus of herbs, belonging to the Natural Order LEGUMINOS^E, which numbers amongst its species the valuable European fodder plant, the Sainfoin, H. onobrychis, Linn. The eight Indian species, however, seem to be of no value as fodder; though a new species, H. Wrightianum, Aitch. et Baker, discovered by Aitchison while with the Afghan Delimitation Commission, is described by him as being greedily eaten by goats and sheep. No attempt seems up to this time to have been made to introduce the cultivation either of Sainfoin or of the Spanish Sainfoin (H. coronarium) into India, a fact probably due to the large number of indigenous fodder plants already available.<br>HELIANTHUS, Linn. / Gen. PL, II., 376.<br>A genus of coarse tall herbs (of the Natural Order COMPOSITE,) which has no species indigenous to India. Two, however, are much cultivated, and are very important economically.                                                                                                                                                                                                | 73.                          |
| <ul> <li>Helianthus annuus, Linn.; Roxb., Fl. Ind., Ed. C.B.C., 60y;<br/>THE SUNFLOWER. [COMPOSITE.<br/>Vein.—Surajmukhiy HIND, ; Surja muki, shuria mukti, BENG. ; surij-kd-<br/>jhar, DEC.; Surajmaki, saryakdnta, BOMB.; Brahmoka, surajmaka,<br/>MAR. ; Adiya bhakti-chettu, podda-trin-%udda-chettu, or produ-tiru-<br/>gudu chettu, TEL.; Suria-mukhi, SANS. ; Gáli-aftab, dftdbi, PERS.</li> <li>References.—Elliot, Fl. Andhr., 12, 154; Mood fen Sheriff, Supp. Pharm.<br/>Ind., 22; Year Book Pharm., 1877* r^9i Lisboa, U. PI. Bomb., T6j<br/>219 fCrooke, Dyeing, 424, 513 ; Ain-i-Akbari, Blochmann's Trans, 1, 85<br/>Sports, Encyclop., 961, 1411; Balfour, Cyclop., //., 32; Smith, Die, 308*:<br/>Kew Off. Guide to the Mus. of Kc. Bot., 85 ; W. W. Hunter, Orissa, IL,<br/>179; Gazetteer, Mysore andCoorg, 1., 62; Official Correspondence, Agri.<br/>Rev. and Com. Dept., 1873, 1877.</li> </ul>                                                                                                                                                                                                                                          | 74                           |
| <sup>14</sup> H. 74                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                              |

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**H.** 74

| HELIANTHU<br>annuus.                                                                         | US Sunflower OIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                                                                                              | Habitat.—An annual herb, bearing large, flat, circular flower-heads;<br>said to be a native of Mexico and Peru, and to have been introduced into<br>Europe about the end of the sixteenth century. It may be of interest to<br>note that the <i>A/tdbt</i> , or sun-flower, is mentioned in the <i>Ain-i-Akbari</i> as<br>a flower cultivated for ornamental purposes during the reign of Akbar.<br>It is largely cultivated in China and Tartary, also in Russia, Germany,<br>Italy, and France, and to a small extent in India, where, however, it is<br>chiefly grown in gardens. It succeeds well in gardens in the plains,<br>flowering during the cold season, and in the hills during the summer; in<br>many hill stations indeed, and markedly so in Simla, it has spread from<br>the gardens to the hill-sides, and, with the <i>dahlia</i> , is rapidly becoming<br>naturalised.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CULTIVA-<br>TION.<br>75                                                                      | Cultivation.—The experimental cultivation of the sun-flower in India<br>was first undertaken at Bangalore in 1873, for the purpose of testing its<br>value in the reclamation of marshy land, and its efficiency in removing<br>malaria from swampy districts. This latter virtue had been drawn atten-<br>tion to in a paper presented to the Soci&e" de Th£rapeutique, which de-<br>scribed the wonderful effects obtained by its cultivation in Holland. These<br>experiments, however, proved that the malaria-dispelling virtues, attributed<br>to the plant, did not exist, though the drainage which had to be employed<br>before it would thrive, naturally improved the climate of the district. Havi ng<br>thus begun, the cultivation of the sun-flower was continued, up to the end of<br>1877, with the view of utilising it profitably in the extraction of the oil, and<br>other economic products to be obtained from its seeds, stem, &c. The last<br>official report regarding the results of this continued cultivation, however,<br>dated November 1877, contains a resolution by the Government of<br>India, to the effect that pending the receipt of reports on the chemical<br>analysis of the oil, it did not seem necessary to continue the experimental<br>cultivation further. This decision was based on the fact, that the results, up<br>to that time, proved that the cost of production of the oil did not permit of<br>prohcable cultivation. Since the date of this decision, no further efforts<br>seem to have been made.                                                                                                                                                                                                                                                                                     |
| DYE.<br>Blossoms.<br>• 76<br>Seeds.<br>77<br>FIBRE.<br>Stalks.<br>78<br>OIL.<br>Seeds.<br>79 | Dye.—According to Balfour "the BLOSSOMS yield a brilliant, lasting,<br>useful dye." Crookes states that the petals are peculiarly rich in the<br>amorphous resinous substance— <i>Xanthin</i> —the base of the yellow pigment<br>from which they derive their colour. The SEEDS contain <i>helianthtc acid</i> ,<br>which, when treated with hydrochloric acid in a current of hydrogen, is<br>resolved into glucose and a violet dye.<br>Fibre.—A useful textile fibre is obtained from the STALKS, (Spons <sup>9</sup><br>Encyclopaedia; Balfour's Cyclopaedia, &c).<br>Oil.—The OIL obtained by expression from the SEEDS is the most impor-<br>tant product of the sun-flower, and is valuable for many purposes. When<br>pure it is said to be equal to olive or almond oil for culinary and table pur-<br>poses; indeed, it is much used for adulterating these more valuable oils,<br>especially in Russia. The oil obtained from the plants grown at Banga-<br>lore, however, was found to be greatly inferior for table purposes. Further,<br>in a report on the subject by the Superintendent of the Experimental Farm,<br>it is stated that the Madras Railway Company condemned it as an<br>illuminating oil, after a series of trials, since they found that its thinness<br>unfitted it for fast running trains; the Superintendent of the Central Jail<br>found that it dried too slowly to be useful in paint; the Ordnance Depart-<br>ment found that it answered all the purposes required in the arsenal, but<br>the price at which it was offered was greater than that of the equally good<br>Kangoon oil. It was found also that four times the quantity as compared<br>with castor oil was required for lubricating machinery, thus necessitating<br>extra attention, and consequently increased expenditure. The author of |

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| The Jerusalem Artichoke, ( <b><i>7. Murray.</i></b> ) HELI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ANTHUS<br>erosus.                 |
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| the article on this subject in Spons' Encyclopaedia writes: •' The chief                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | OIL.                              |
| industrial applications of the oil are for woollen dressing, lighting, and<br>candle and soap-making; for the last mentioned purposes it is superior<br>to most oils." In the form of OIL-CAKE it is a valuable food for cattle and<br>poultry.<br>A consideration of the uses of this product, and the attempts which                                                                                                                                                                                                                                                                                                                                                  | Oil-cake.<br>80                   |
| have been made to employ it in India, seems to indicate that it is certainly<br>of value, but that the cost of production by present methods is too great to<br>encourage any hope of its competing as a lubricant, table oil, or illumi-<br>nating material with other oils of perhaps greater utility, and certainly of                                                                                                                                                                                                                                                                                                                                               |                                   |
| lower 'price It is also doubtful whether it could be exported profitably<br>for other industrial purposes.<br>Food and Fodder.—" In Russia the SEEDS are sold in the streets and<br>eaten as nuts" ( <i>Smith</i> ). They are also roasted and used as a substitute                                                                                                                                                                                                                                                                                                                                                                                                     | FOOD.<br>Seeds.                   |
| for coffee.<br>They are highly valued for feeding sheep, pigs, poultry, pigeons, rab-<br>bits, &c, and are considered superior to linseed for cattle. In many parts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 81<br>FODDER.<br>Seeds.<br>82     |
| of Europe, indeed, the plant is cultivated extensively owing to its SEEDS forming a useful food for domestic animals. The OIL-CAKE also, as already mentioned, is used to feed cattle. The LEAVES are said to be unliable as folder for settle and hereas but Colored as recently                                                                                                                                                                                                                                                                                                                                                                                       | Oil-eake.<br><b>83</b>            |
| valuable as fodder for cattle and horses, but Colonel B odd am records<br>the fact that " in Mysore the cattle do not take to them so readily as in Eu-<br>rope.*'<br>Domestic Uses.—The leaves and stalks make a valuable MANURE, either                                                                                                                                                                                                                                                                                                                                                                                                                               | Leaves.<br><b>84</b><br>DOMESTIC. |
| directly ploughed in or as a box manure after being used as cattle litter.<br>The stalks are said to be useful as FUEL, and to yield potash from their ashes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Manure.<br>85<br>Fuel.            |
| Smith observes that "it is an excellent plant for bees, lar^re quantities of HONEY and WAX being obtained from the flowers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>86</b><br>Honey &<br>Wax.      |
| Helianthus tuberosus, Linn. DC. Prodr., V.9 sgo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -83                               |
| <ul> <li>Vern.—ffattickdk, HIND.; Brahmoka, BENG.j Atipick, NW. P.; &amp; PB.;<br/>Hattichok, MAR.; Hattichok, Guz.</li> <li>References.—DC. Origin Cult. PL, 42; Ferminger, Man. of Gardening for<br/>India, 160,• Atkinson, Ec. Prod. NW. P.,pt. V.,18; Lisboa, U. PI.<br/>Bomb., 162; Birdwood, Bomb. Pr.<sub>9</sub> 164; Reports, Dir. Lend Rec. and<br/>Agri., Bengal; Dir. Land Rec. and Agri., Poona; Collector of Cudda-<br/>Pah Dist., Madras; Smith, Die, 228; Journ. Agri. Hort. Soc, 1873-74,<br/>Vol. IV., Sees, r, 4; Gazetteer 1 Mysore and Coorg, /., 62.</li> <li>Habitat.—A perennial herb, attaining a height of 6 to 10 feet, with rod-</li> </ul> | -<br>-<br>-<br>-                  |
| like stems, and solitary terminal yellow flowers. It is, according to<br>DeCandolle, a native of North-East America. Cultivated generally in<br>the gardens of Europeans in India, and, according to Atkinson, "is<br>slowly making its way amongst the Natives." The English name Jeru-<br>salem Artichoke is a corruption of the Italian girasole, meaning sunflower,                                                                                                                                                                                                                                                                                                 | ,                                 |
| combined with an allusion to the artichoke-like flavour of the root.<br>Cultivation.—The Jerusalem artichoke was first introduced into Eu-<br>rope at the Farnese Garden at Rome about 300 years ago, and rapidly                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CULTIVA-<br>TION.                 |
| spread over Europe. It was cultivated for its roots, which, before potatoes<br>were known, were more used as an article of food than they are now.<br>The plant is, however, still much cultivated both in Europe and in this<br>country. Regarding the method of cultivation Ferminger writes : "The<br>ordinary soil of the garden generally suits it without the addition of much<br>manure. The tubers are put into the ground in May, in rows about a foot<br>and a half apart, and with the same distance between each plant, and<br>three inches deep. The plants grow to three or four feet high, and pro-                                                      | 89                                |
| · <sup>1</sup> * <sup>A</sup> H. 89                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                   |

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| HELICTERE                                       | S The East Indian Screw tree.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LSORA.                                          | duce their sunflower-like blossoms in abundance; these possibly it would<br>be of considerable advantage to remove before they open. When the tubers<br>are taken up they skould be stored away in large flower-pots, well covered<br>with earth, or they will be liable to shrink and shrivel from "exposure to<br>the air." The Director of Land Records and Agriculture, Bengal, how-<br>ever, writing of the propagation of this plant by seed, directs that they<br>should be sown in August so as to allow of the removal of the plants in<br>November without disturbing the roots. The following report regarding<br>its cultivation in Bombay has also been received from the Director<br>of Land Records and Agriculture, Poona : "This vegetable is sparingly<br>grown; it is propagated Dy uiDers and requires ncn 10am. *u «»^ 1+~ t                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| FIBRE.<br>Stems.<br>90<br>FOOD.<br>Roots.<br>91 | part of May the eyes are planted    feet apart in furrows at a depth of<br>about three inches, and are watered every tenth day. As the plants grow<br>they should be earthed up like potatoes. The plants flower by the end ot<br>August, when watering is stopped, and after the plants have dried up the<br>crop is dug out. The tubers for the next year's propagation are kept<br>buried in sard in the shade. The acre yield is at about 3 tons."<br>Fibre.—The STEMS are said by Balfour to yield a rich textile fibre.<br>Food.—The TUBEROUS ROOTS are used as a vegetable. Champlain,<br>in 1603, found the root thus employed by the natives of North America;<br>he wrote, that they ate " roots which they cultivate and which taste like an<br>artichoke."<br>The plant was brought to Europe as already described, thence prob-<br>ably it was introduced into India, where it is much eaten by Europeans and<br>to a small extent by Natives. In Kathiawar it is boiled in milk, and is<br>considered, by the Natives, a strengthening vegetable. It is generally<br>said to be more wholesome and nutritious than the potato, and may be<br>given to invalids when abstinence from other vegetable food is neces-                                                          |
| 02                                              | <ul> <li>sary.</li> <li>HELICTERES, Linn.*, - Gen. PI, /., 220, 983-<br/>A genus of the Natural Order STERCULIACE/E, comprising 10 Indian species, of which only one is of known economic value.</li> <li>Helicteres Isora, Linn.; Wight, Ic., u 180; FL Br. Ind., /., 3<sup>6</sup>5 &gt;<sup>m</sup></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ~                                               | STERCULIACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                 | <ul> <li>THE EAST INDIAN SCREW TREE.</li> <li>Syn. — HELICTERES CHRYSOCALYX. Miq; H. ROXBHURGHII, G. Don.</li> <li>VETL.—Maraphali, maror-phulti, jonkaphal, bhendu, HIND.; Atmoré, BENG.; Renta, sakomsang, KOL.; Aiteni, KHARWAR; Petchamra, SAN-TAL; Mori, MAL. (S.P.); Muri-muri, URIYA; Aita, GOND&amp; Ainshia, dkamin, MONGHYR; Mararphal, bhendu, NW.P.; Marorphali, kupásó, (BAZAR FRUIT=marorphali), PB.; Bottu ka, C. P.; Marori-képhálli, maradsing, kevan, kewanne, dhamni, DEC.; Hah, GODAVERT; Khiram, kewan, kevana, (theinnt=muruddsenga), BOMB, ; Kewan, MAR.; Muraasing, Guz.; Valumberi, valampufi, vadampiri, TAM.; Nuliti, kavanchi* syamali, ddasyamdli, gubadarra, TEL.; Kori-buta, KURKU; Anteri BANWARA; Kavargi, KAN.; Khungiche, thu-guay-khya, BURM, J; ^*<sup>max</sup>gaha, lineya-gass, SING.j Awartani, mriga-shinga, SANS; Kisqf-ourkisht, pechak, PERS.</li> <li>References.—Roxb., Fl.Ind., Ed. C.B.C., 506; Kure, For. I<sup>T</sup>. Burm. /., 142; Beddome, Fl. Sylv. Anal. Gen., t. 5; Gamble, Man. Timb., 40, Dalz. &amp; Gibs., Bomb. FL, 22; Stewart, Pb. PL, 25; Elliot, I<sup>T</sup>. Andr. MO, 89, 171. Ainslie, Mat. Ind., II., 447; O'Skaugknessy, Beng. Dispens., 228; U. C. Dutt, Mat. Med. hind., 293; Dymock, Mat. Med. W</li> </ul> |
|                                                 | <ul> <li>Datz. &amp; Gibs., Bomb. FL, 22; Stewart, Pb. PL, 25; Elliot, I'P. MO, 89, 171 Ainslie, Mat. Ind., II., 447; O'Skaugknessy, Beng. Dipens., 228; U. C. Dutt, Mat. Med. hind., 293; Dymock, Mat. Med. Wind., 2nd Ed., tT3; Pharmacog. Ind.,1.,231; S.Arjun, Bom. Drugs, JS Murray, PI. and Drugs, Sind, 56; Med. Top., Ajmir, 146; Year boog Pharm. 1878, 290; Irvine, Mat. Med. Patna, 66; Moodeen Sherij Mat. Med., Madras, 67; Atkinson, Him. Dist., 306, 739; Lisboa, U. F. H. 92</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

The Fibre of the Indian Screw tree. (J. Murray,)HELICTERESBorn,, 229 ; Bird-wood, Bomb. Pr., 10 ; Liotard, Paper-making Mat., 14 ;Cross, Sevan, King, Rep. on Indian fibres., 10, S3; Rev. A. Campbell,Ec. Pr., Chutia Nagpur, S44S / Mason, Burma and Its People, 502, 753 ;Indian Forester, IV., 228, 233, 323 ; VIII., 417 ; IX., 274, 325, 326; XII.,App., 7 ; XIII., 119; XIV., 296; Balfour, Cyclop., 11., 32; Treasurv ofBot., I., 5753 Kew Report, 1879\*34 i Por. Admn. Rep., Ch. Nagpur, 1885,6,28; Rep. Exp. Farm, Madras, 1884,9 s Madras Man. of Admn.,!\*> 3'3; Gazetteers -.--Mysore and Coorg, I., §8; Rajputana, 26; N.-W.P'> I\*> 79; IV., Ixix. ; Bombay, XIII., 25; XV., 71.

Habitat.—A large arborescent shrub of the dry forests throughout Central and Western India, as far west as Jamu, the Central Peninsula, and Ceylon. (*Fl. Br. Ind.*). According to Stewart and other writers it is found wild in the Siwalik trac for some distance into the Panjáb.

Fibre.—The FIBRE extracted from the bast is strong, thin, silvery, and reticulated, and when combed resembles jute in appearance. In the report on Indian Fibres by Cross, Bevan, King and Watt, the following analysis is given: moisture, io\*8; ash 3\*1; cellulose, 567; and as the result of hydrolosis, a (by boiling for 5 minutes in a 1 per cent, solution of caustic soda) 12\*0, b (by boiling for an hour) 202 per cent, of weight were lost. The length of the ultimate fibre is 1–2 mm. The fibre is very useful for cordage, rough sacking, and canvas, and would appear also to be suitable for paper-making. The following extract from the report of the Madras Experimental Farms for 1884 is of interest: "This fibre, a sample of which was exhibited at the Madras Agricultural Exhibition of 1883, and attracted the attention of the judges, was identified by Professor Lawson as H. Isora, and enquiries were instituted to ascertain its local distribution and the quantity that would be likely to be available for commerce. It is found chiefly in South Kanara, Malabar, Kurnul, Ganjam, and Coimbatore, but there is nothing known as to the quantity that could be made available accurately for trade. A sample was procured from Kurnúl and forwarded to Messrs. Arbuthnot & Company for trial, but from a report that has been recently received from them, it would not appear that this fibre is suitable for weaving. It is probably adapted only for cordage.' The report makes no reference to any trial having been made of it as a paper-making material.

Medicine.—The CAPSULE, which consists of 5 linear, many-seeded carpels, spirally twisted, and terminating in a thick point to form a cone from if to 2 inches long, has long been employed medicinally in India, and is still one of the commonest bazar drugs in most parts of the country. Its use, however, seems to depend almost entirely on the ancient " theory of signatures," the peculiarly twisted carpels being supposed to resemble the folds of the intestine. It is accordingly chiefly employed in intestinal complaints, entering into most native prescriptions for colic, flatulence, diarrhoea, and intestinal strangulation. In the Konkan itJs said to be also used as a remedy for snake-bite, and in diabetes. AinsTie describes its employment also, in powder, mixed with a quantity of castor oil, as an application for discharge from the ear. The authors of the *Pharmacographia lndica* consider that its chief virtue lies in its harmlessness, and they have been unable to discover any therapeutic properties in the plant, beyond those of a demulcent and mild astringent. Moodeen Sheriff, on the other hand, describes it as •' tonic and stomachic, and useful in all the diseases for which gentian and chiretta are ordinarily employed," and recommends it for these purposes in doses from one to two drachms twice or thrice a day. The Revd. A. Campbell describes the ROOT and BARK as also employed medicinally by the Santals for the same purposes as the fruit.

MEDICINE. Capsule. **94** 

FIBRE.

93

Boot.

&. 96

<sup>213</sup> 

| HELIOTRO<br>indicum                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE.<br>FODDER.<br>Leaves.<br>97<br>TIMBER.<br>DOMESTIC<br>and SACRED.<br>Fruit.<br>98<br>TRADE.<br>99 | SPECIAL OPINIONS.—§"Used for worms and colic in children." (Surgeon*<br>Major Robb, Civil Surgeon, Ahmedabad). "The fruit is used in diarrhoea, ax<br>well as in constipation of newly-born children. A piece of the fruit tied<br>on the body of a newly-born infant is believed to protect it from all kinds<br>of bowel complaints/" (Civil Surgeon J. H. Thornton, B.A., MM-,<br>Monghyr).<br>Fodder.—Buffaloes eat the LEAVES. (R. Thompson). m<br>Structure of the Wood.—White, soft. Weight 35ft per cubic foot.<br>The branches are used for fuel, fencing, and thatching.<br>Domestic and Sacred Uses.—The FRUIT is said to be used in the <sup>m</sup> .^ <sup>rna</sup> £f<br>ceremonies of the Vaisya caste, when it is tied upon the wrists of bride ana<br>bridegroom along with that of Randia dumetorum, .<br>Trade.—Atkinson, in his account of the Himalayan, District, nymtions<br>that about one ton of the fruit is exported from the Kumabn forests annual-<br>ly. DP. Dymock gives the trade price in Bombay as R3J per Surat<br>maund of <b>3/3</b> <sup>m</sup> . |
|                                                                                                             | <b>HELIOTROPIUM,</b> <i>Linn.; Gen. PI., II, 843.</i><br>A genus of annual or perennial herbs belonging to the Natural Order<br>BORAGINE'E, and comprising 100 species, distributed over the tropical and<br>temperate zones of both hemispheres. Of these 16 are known in India, and 4<br>are reputed to be of medicinal value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Z</b> 00                                                                                                 | Heliotropium Eichwaldi, Steud.; FL Br. Ind., IV., 149; BORAGINE*.<br>Syn.—HELIOTROPIUM ELLIPTICUM, Ledeb.; H. STRICTUM, Ledeb.; H.<br>MACROCARPUM, Guss.; H. EUROPIUM, Aitch., Stewart, ? Linn.<br>VernM7 kattei, bithta, atwin, popat bitit, gidartamdku, HIND.; Nil<br>kattei, bithta, atnān, popat búti, gidar tamdH, PB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| e                                                                                                           | <ul> <li>References.—Boiss., FL Orient., IV., I3I; Benth., Fl. Austral., IV., 394;<br/>Stewart, Pb. PI., 154; Aitchison, Cat. Pb. and Sind Pl., 94f Aitch.,</li> <li>A/gh. Del. Com., 88; O'Shaughnessy, Beng. Dispens., 497; Dymock,</li> <li>Mat. Med. W. Ind., 2nd Ed., 575; Murray, PL and Drugs, Sind, 171 /<br/>Indian Forester, XII., App., 17.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MEDICINE.<br>Leaves.<br>101                                                                                 | Habitat.—Common throughout the Pan 'jab and Sind, found also in Kashmir ascending to an altitude of 5,200 feet.<br>Medicine.—The LEAVES applied locally are used in cases of snake-bite, bite from a mad dog, and scorpion or wasp sting. They are also said to be of service as an application for cleansing and healing ulcers and for destroying warts; given internally they are emetic. The properties of the plant, therefore, are very similar to those of H. europaeum with which the plant has been confused, and which was medicinally employed by the Greeks under the name of <i>ifXioTpomov TO uiya</i> , while by the Romans it was known as <i>Herba Solaris</i> .                                                                                                                                                                                                                                                                                                                                                                                                          |
| 102                                                                                                         | H. indicum, Linn.; Fl. Br. Ind., IV., 152; Wight, Ic, t. 171.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                             | <ul> <li>Syn.—HELIOTROPIUM ANISOPHYLLUM, Beawo.; TIARIDIUM INDICUM,<br/>Lehm.; T. ANISOPHYLLUM, G. Don.; HELIOPHYTUM INDICUM, DC;<br/>H. VELUIINUM, DC.</li> <li>"Vern.—Hatta-jtlrie, hatta-s&amp;ra, siriari, HIND.; Hdtisurd, URIYA; ftdti-<br/>surd, BENG.; Chappu tattu, C.P.;Burundi, BOMB. 5 Bkurundi, MAR;;<br/>Tel'kodduki, telmunnie, TAM.; Ek-satiya. SING.; Hatisunadd, sr*-<br/>hastini, bkurûndi, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 152; Dale. &amp; Gibs., Bomb. Fl.,<br/>'72: Ainslie, Aat. Ind., H. 414. O'Shaughnessy, Ben*. Dispens., 497./<br/>U.C. Durf. M. at. Ind., 114. O'Shaughnessy, Ben*. Dispens., 497./<br/>S74 • JrmiH fS'Fif&amp;***ind.; 2999; JJymeerk, Matt Mad., W. Ind., 2nd Ed;<br/>Hikie7^U^K^ed^Patna*^f^ndikn Forester, VI., 238; W. IV.<br/>S9r&amp;m££xv!f43'9."&gt; • Ppt VI :; G<sub>«</sub>**n**rs ^Mysore and Coorg, /.,<br/>H. 102</li> </ul>                                                                                                                                                                          |

### Heliotrope.

## (J. Murray.) HELLEBORE.

Habitat.—A small annual herb, common throughout India, especially in the moister parts. According to Roxburgh it is most often found in out-of-the-way corners, and amongst rubbish where the soil is rich. Medicine.—Irvine describes the LEAVES as employed in Patna in cases of fever, the dose given being from half a drachm to three drachms. 103 Ainslie, recounting its medicinal properties, says: "The JUICE of the leaves of the plant, which is a little bitter, the native practitioners apply to painful gum-boils, and to repel pimples on the face; it is also prescribed as an external application to that species of ophthalmia in which the tarsus is inflamed or excoriated." He further adds, " I find B rah am tells us that it cleans and consolidates wounds and ulcers, and that, boiled with castor oil, it relieves the pain from the sting of a scorpion, and cures the bite of a mad dog." It thus, in its last given properties, resembles the immedi-a.ely preceding species. Dr. Dymock writes that " in Bombay the PLANT Plant. is used as a local application to boils, sores, and the stings of insects and reptiles." 105 Heliotropium strigosum, Willd./ FU Br. Ind., IV., 75/. In the Flora of British India H. brevifolium, Wall., is reduced to be x06 a variety of this species (var. brevifolia), and H. compactum, Don, is given as a synonym for that variety. VeTn.—Safed-bhangra, chitiphM, tlinn.; Safed bhangra, kharai, tindu, gorakh pánto (chiti phul, gorakh pdnu=ba.zir plant), PB.
References.—Stewart, Pb. PL, IS4; Aitchison, Cat. Pb. and Sind PL, 94; Baden Powell, Pb, Pr., 360; Atkinson, Him. Dist., 314, 739: Indian Forester, XII., app., 17; Gazetteers, N.-W. P., IV., lxxv.; Bombay, XV., 439. Habitat.—A small plant, according to the Flora of British India, common throughout India, especially the variety brevifolia. It appears to be only described as of economic value, however, by writers on the Panj 4b, North West Provinces, and Sind. Medicine.—The whole PLANT has laxative and diuretic properties. MEDICINE. According to Atkinson and Baden Powell, the JUICE is employed as an application in ophthalmia, presumably granular, and gunv6oils, for the 107 purpose of promoting suppuration, and to wounds and ulcers to hasten healing. Like that of the other species already described its juice is 108 supposed to have curative powers in cases of poisonous bites and venomous stings. **H. undulatum,** Vahl.; FL Br. Ind., IV, 130. 109 Syn\*—HELIOTROPIUM PERSICUM, Lamk.; H. CRISPUM, Desf.; H. BRIO-CARPUM, Delile; H. RAMOSISSIMUM, Sieb.; H. AFFGHANUM, Boiss.; LITHOSPERMUM HISPIDUM, Forsk. This species has, according to the Flora of British India, two varieties, one, the typical F. undulatum, the other, var. suberosa, to which H. nubi-CUtn, Bunge, has been reduced. Vern.—Pipat-buti, jati misdk, PB. References.—Boiss., Fl. Orient., IV., 143, 147; Stewart, Pb. PL, 154; ^ Aitchison, Cat. Pb. and Sind PL, 95; Afghan Del. Com., 88. Habitat.—Found in the Panjab, Sind, and the Upper Gangetic plain, reaching a height of 1,000 feet; distributed to Western Asia and North Africa. Medicine.—Stewart describes this PLANT as being, like H. strigosum, of MEDICINE. Plant. value in snake-bite, in which cases it is both administered internally and applied externally to the wound. As an external application it is some-110 times employed mixed with tobacco oil. Hellebore! Green; see Veratrum viride, Aiton; LILIACEJE. H no

2 I S

Plant. Juice.

MEDICINE. Leaves.

> Juice. 104

| HELLEBOF<br>niger.        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | HELLEBORUS, Linn.; Gen. PL, I., 7.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| III                       | Helleborus niger, Linn.; DC, Prodr, I., 46; RANUNCULACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                           | BLACK HELLEBORE or CHRISTMAS ROSE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| MEDICINE                  | <ul> <li>Vttn.~Kala-kutki, BENG.; Khorasani kutki, BEHAR J Kala-hutki, DEC.</li> <li>Kdddgaruganie, TAM.; Katukaró-gani, TEL.; Katuroum, katurohim.</li> <li>SANS.; Khertic or kartick, kherbek aswed, ARAB.; Kherbeck-seeah, FERS.</li> <li>It is doubtful whether' the above vernacular names are really applied to HELLEBORE at all, though by many writers they have been given to it.</li> <li>References.—O'Skaughnessy, Beng. Dispens., 41 Bent. &amp; Trim.9Med<sup>*</sup>, PI., /., No. 2; S. Arjun, Bomb. Drugs, 3; Murray, PI. and Drugs Sind, 72; Irvine, Mat. Med. Patna, S3; K. L. De, Indig. Drug. Ind., sS; Birdwood, Bomb. Pr., 3; Kew Off. Guide Mus. of Ec. Bot., 7-Habitat.—A small, perennial herb, with black, jointed, definite rhizomes having numerous interlacing rootlets. It is a native of Central and South Europe, extending eastwards to South Poland and westwards to Dauphiny and Provence. According to Boissier it is also indigenous to Greece.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MEDICINE.<br>Root.<br>112 | "Ainslie says, with a degree of hesitation and doubt, that the plant which<br>yields this drug is met with in Nepal, and he gives the above vernacular                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ſ                         | <b>names for it.</b> Dr. W. O'Shaughnessy, in his <i>Bengal Dispensatory</i> , giver<br>an abstract of Ainslie's information, and is followed by Birdwood in his<br><i>Bombay Products</i> , K. L. De in his <i>Indigenous Drugs of India</i> ,' and<br>later still, Murray in his <i>Drugs of Sind</i> . All these authors have simply<br>compiled from Ainslie, altering the original information only so far as to<br>remove the hesitation with which Ainslie published the statement that<br>Hellebore was produced in Nep4l. But even Ainslie derived his inform-<br>ation from Dr. Kirkpatric, who writes that it is known in Nep4l as <i>kutka</i><br>and that it also reaches India by way of the Red Sea. As a matter of<br>fact, however, the plant has never been found in Asia in a wild state, and<br>if it exists in India at all it could only be in flower gardens at our hil<br>stations, but it is doubtful if it could grow even there much below an alti<br>tude of io£.oo feet. Muhammadan physicians do, however, prescribe a<br>drug which is known as Hellebore, as also many others which neither<br>grow nor are imported into India. Dr. Royle explains this by stating<br>that the Muhammadans obtained their medical science from the Arabiar<br>physicians, who, in their turn, learned it from the Greek authors. Euro<br>pean plants have thus come to be known by name in India, and Royle<br>includes in his list of such, the roots of the black Hellebore, remarking<br>that the druggist, trusting to the indifference of the physician and the<br>ignorance of the patient, substitutes for such drugs others with supposed<br>similar properties. This is remarkable and curious: the symbolic " Recipe<br>being apparently in the eyes of the physician of more importance than th<br>ingredients of the mixture, for one cannot quite believe that he is wholl<br>ignorant of the non-existence of the medicines he has prescribed. It i<br>amusing how persistently even the commonest <i>hakim</i> will mysteriously |
| ۰<br>,                    | mention the almost sacred Greek synonyms for his drugs. A knowledg<br>of such matters seems to constitute his highest credentials.<br>"I have already drawn attention to the fact that Actaea spicata and<br>Cimicifuga foetida (two common Himalayan plants related to Hellebore<br>are apparently not known by the Indian doctors to possess medicina<br>properties. They are largely used as drastic purgatives in adulteration<br>with Hellebore, both in Europe and America, besides possessing certain<br>distinctive medicinal properties." Dr. Watt, revising the above paragraph<br>has kindly, added : « According to Drs. Moodeen Sheriff and Dymock<br>nowever, Muhammadan physicians substitute the root of Picrorhiza Kuroo<br>H. 112                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| sepia                 | ra                                                                                 | Useful Fodder.                                                                                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| •                     | the<br>Acti                                                                        | n, M.B., I.M.S.                                                                                                                                                                                                                                 |
|                       | <br>Halmia and Diagonada                                                           | hulliform D dimension D formentage and D <sup>2</sup> fm                                                                                                                                                                                        |
|                       | Helmia, see Dioscorea                                                              | bulbifera, D. d*mona, D. tomentosa, and D. tr                                                                                                                                                                                                   |
|                       | HEMART                                                                             | phylla, Vol. III., 128-134]<br>HRIA, Br., Gen. PI. Ill, 1131.                                                                                                                                                                                   |
|                       | A genus<br>DROPOGONÆ                                                               | INER, and belonging to the Tribe AN-                                                                                                                                                                                                            |
|                       | is prohably                                                                        | or which the second. H. fascichlafa.                                                                                                                                                                                                            |
|                       | of this work,<br>ties, habitat,                                                    | They may, therefore, for the purposes<br>or H. compressa, since their proper-                                                                                                                                                                   |
| 113                   | •                                                                                  | GRAM<br>Sa, X. Br., DuthU, Fodder a f f i of $Y_{nd}$ .                                                                                                                                                                                         |
|                       | ^^SsgV^Si<br>leaves ani smaller and m<br>Rottbeellia fasciculate,<br>cnlata. & «,, | ∧S. ∧j£ asse f Northern In-<br>nore crowded aM^# diffenn 8 '>haying shorter<br>Desf., R *Z!XL!,''• J <sup>r</sup> ?°»Jy»» **** vanety are<br>attissuna, Po,r.; Lodicnlaria faso>                                                                |
|                       | Vern/f <sub>alM</sub> A^,                                                          | <i>Luiskas</i> Paniheri> BBN(J · , , ∧ ∧ N w. P – , <b>cheroá</b> ,                                                                                                                                                                             |
|                       | IV., 1828.                                                                         | Ft inA »L. C.B.C., 118; Royle, Him. Bot., 422;<br>A: Duthie, Ind. Fodder Grasses of Plains of<br>Select Extra-Trop. Plants, 198; Balfour,<br>Treasury of Bot., 11., 992; Gas., NW. P., 1., 86;                                                  |
|                       | Roxburgh says that a                                                               | grass of Bengal, inhabiting also the plains of<br>lest Provinces, and the hills at low ations.<br>found on the borders of lakes, amo S other<br>brushwood; and he mentions the variety R.<br>sture lands, the borders of rice-fields, and other |
| OD and<br>DDER<br>114 | <b>Food</b><br>in<br>Bwon Von Mueller, in<br>perennial grass, though               | forms a good food for cattle, and, accord-<br>ncipal article of cattle fodder in Dacca,<br><i>£S\$M</i> : Extra-Tropical Plants, writes: "This<br>tmewhat harsh, is recommend for moist                                                         |
|                       | jured by moderate frost ;"<br>resistant to drought."                               | a beautiful greenness throughout year in dry<br>y graziers in Gippsland (Victoriz, it is not in-<br>and in a further passage he says: "Remarkably                                                                                               |
|                       | HEMICYCLIA                                                                         | , Hook. et Arn.; Gen. Pl., 111., 278.                                                                                                                                                                                                           |
|                       | A Setting of frees or should                                                       | s belonging to the Natural Order EUPHORBIACER,<br>ies, only two of which, however, are of known                                                                                                                                                 |
| «5                    | Hemicyxlia sepiara <i>Wi</i>                                                       | [Ic., t. 1872; EUPHORBIACRE.<br>sht Arn.; Fl. Br. Ind., V., 337; Wight,<br>proK./p.Rie,DA, Wall.                                                                                                                                                |
|                       | References. A.M.; W                                                                | ira-grass SINC                                                                                                                                                                                                                                  |
|                       | Thwaites, En<br>Flowering F<br>Indian Fores                                        | Gamble, Man. Timb., 347;<br>Fibs., Bomb. Fl., 229; Trimen,<br>Lisboa, U. Pl. Bomb., 118;                                                                                                                                                        |
|                       | HabitatA                                                                           |                                                                                                                                                                                                                                                 |
|                       | southwards, ascending for<br>most charac Wistt: t t1                               |                                                                                                                                                                                                                                                 |
|                       |                                                                                    | n elevatic very common                                                                                                                                                                                                                          |

| Indian Sarsiparilla. (J.Murray.) HEM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | IDESMUS<br>dicus.        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Structure of the Wood.—Hard, close-grained, resembling boxwood.<br>The longitudinal flutings characteristic of the stem are, in Ceylon, split off<br>and employed to make axe handles. There is no account of this close-<br>grained hard wood being employed for the purposes of turning, &c, for<br>which it would seem to be well suited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | • тімвек.<br><b>11б</b>  |
| Hemicydia sumatrana, MuelL; FL Br. Ind., V., 338.<br>Reference.—R urz, For. FL Burma, II., 365.<br>Habitat.—An evergreen tree, from 30 to 50 feet in height, inhabiting the<br>tropical swamp forests of Martaban and the Irawaddi in Burma, and the<br>Andaman Islands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 117                      |
| Structure of the Wood.—Heavy, pale greyish brown, coarsely fibrous but^lose-grained though soft. A fine wood. ( <i>Kurs</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TIMBER.                  |
| HEMIDESMUS, Br.; Gen. PL, II.; no.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          |
| A genus of the Natural Order ASCLEPIADEJE, having only one Indian species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |
| Hemidesmus indicus, R. Br.; FL Br. Ind., IV., \$; Wight, Ic, t.<br>INDIAN SARSAPARILLA. [594; ASCLEPIADJB.<br>Syn.—HEMIDESMUS WALLICHII, Miq.; PERIPLOCA INDICA, Willd; As-<br>CLEPIAS PSEUDOSARSA, Roxb. excl. Jyn.—-Burnt., Thes. ZeyL; Rheede,<br>Hort. Mai.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 119                      |
| <ul> <li>Var. pubescens. SYN. — H. PUBESCE NS W. &amp; A.</li> <li>VAR. — agr, jangli-chandelli, hindi-süls, HIND.; Anantamul, ananåri, andi-såd.ananål, BENG.; Ununta-mål, BENARI; Surgandi-påld, nannåri, nåt-kå-aushbah, DEC.; Uparsåra, BOMB.; Anantamul, upalasari, MAR.; Mannarl. 1 AM.; Uadisuganahi, pala-chukkani-aeru, suganani-pala, tetia sugan-dhipdla, palasugandhi, muttapulzam, TEL.; Sogadaheru, sugandha-pdlada-gidd, KAN.; Nanndri-kitthanna, naru-ninti, MALAY.; Irimusu, SING.; Anantd, sugandki,gdfri-mulam, sdrvod, SANS.; Zaiydn, aushbatunndr, ARAB.; Aushbahe-hindi, ydsa mine-barri, PERS.</li> <li>References. — Roxb., FL Ind., Ed. C.B.C., 254; Gamble, Zian.Timb., 266; Thwaites, En. Ceylon PL, 195; Dalz. &amp; Gibs., Bomb. FL, 147; Aitchison, Cat. Pb. and Sind PL, 90; Voigt, Hort. Sub.Cal.,S44; Rheede, Hort. Mai., X., t., 34; Trimen, Cat. Flowering Plants, &amp;c., of Ceylon, 55; Elliot, Flora Andhr., \$6, 127, 142, 143, 170, 179; Pharm. Ind., 140; Aimlie, Mat, Ind., I., 381, 630; O'Shaughnessy, Beng. Dispens., 456; Moodeen Sheriff, Supp. Pharm. Ind., iSh 283; U. C. Dutt, Mat. Med. Hind., 195, 291; Dymock, Mat. Med. W. Ind., 20, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$100, \$1</li></ul> | FIBRE.                   |
| as "fine and strong."<br>Medicine.—The ROOT has long been employed in Southern India as an<br>alterative and tonic. It is foand in Indian commerce in the form of little                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120<br>MEDICINI<br>Root. |
| bundles, which consist of the entire roots of one or more plants often several feet long, tied up with a portion of the stem. The root itself is cylindrical, tortuous, from $^{\circ}$ to f $^{\circ}$ of an inch in diameter, and seldom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 121                      |
| Н. 121                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | I                        |

<u>به</u>

| HEMIDES            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE,          | branched, 7he fresh or fre hl, dried root has colour $< f$ to*** beans or<br>mellit, an.7 sweet b utsh chily acrid taste.: (Dymock.) It was first<br>in troduced to the med brotessit in the British Pharmacopoeia, while in 1831. and<br>in 1864 it was adeofficial in the British Pharmacopoeia, while in 1868<br>i. was include, amongst the drMgs in the Pharmacopoeia of India. Dutt<br>informs us (Hinwd MaA Med) that the roots of Hemidesmus and Ichno-<br>carpus frut TL are oth called Sdr*** in Sanskrit medicine, and are<br>described under the name of Sdrivddvaya or the two Sdrivds. They are<br>often used Aether, StrMe the Hindus consider both as tonic, sweet, demul-<br>cent, And alteratily e, and they prescribe them in dyspepsia, loss of appetite,<br>skin diseases, syphilis, and leucorrhcea. By native practitioners the SMvd<br>informs is cases of gravel and strangury, given in powder, mixed<br>with cow's milk; they also give it in decoction, in conjunction with cummin<br>see as, to purfy the blood and correct the acrimony of the bile.'' Hefur-<br>iner mentions that in his time the decoction was employed by European<br>practitioners in India as a substitute for true sarsaparilla, ''in cutaneous dis-<br>eases, scrofula, and venereal affections to the quantity of Jiii or Xvw three<br>times a day.'' '00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| c<br>Juice.<br>122 | Roxburgh wrote: "The natives employ them " (the roots) "in medicine<br>more than we do, particularly for the thrush in children. For this<br>disorder the dried bark is powdered and fried in butter, the proportion<br>uncertain as is often the case with Hindu prescriptions, the quantities being<br>" $ff!^{era} \pounds^{ue}$ about a drachm of this is given, night and morning."<br>The medicinal properties of Hemidesmus seem to be either unknown or<br>unappreciated in the more northern parts of India, where it is very seldom<br>employed. Thus Dr. Dymock writes : "In the northern part of the<br>com bay Presidency its medicinal properties appear to be ignored, as, though<br>compon everywhere in the neighbourhood of Bombay, it is never collected<br>qy tne Mtives." In the more southern parts of the Konkan, however, he<br>aescribes it as extensively employed. The MILKY JUICE is used in that<br>region as an application to the conjunctiva in ophthalmia; the root, roasted<br>in plantain leaves then beaten into a mass with cummin and sugar, and<br>mixed with $gh\%$ as a remedy in genito-urinary diseases, and also as an<br>external application or $Up$ for swellings. Great difference of opinion<br>exists amongst European practitioners regarding the efficacy of this plant<br>s an _alterative, but it is generally regarded as at least an efficient<br>substtute for Sarsaparilla. In England it is very little employed except<br>at St. Bartholomew's Hospital, where it has for many years taken the<br>place of Sarsaparilla. There seems to be no doubt that the roots ought<br>to be employed when fairly fresh, and that their medicinal virtues decrease<br>greatly as they become old and dried up. For this reason it appears prob-<br>able, that the specimens sent to Europe may have been inferior to those<br>obtainable in this country: the authors of the <i>Pharmacogra phia</i> indeed<br>observe." the root found in the English market is often of very bad |
|                    | in £!5?fi <sup>L</sup> Opi NI(J <sup>NS</sup> S " Used commonly as a substitute for Sarsapanlla<br>Sahlrin <sup>A</sup> ? <sup>nd</sup> r <sup>heumatic</sup> affections" (Assistant Surgeon Nehal Sing,<br>$SuZe?_n^{P} \cdot r^{e)mA} \stackrel{c}{\sim} *!^{eaP}$ and very good substitute for Sarsaparilla"<br>syphilUic di L? <sup>TM1</sup> Shahabad). " Is a useful alterative and tonic In<br>Murray, M.B. V'^ a 's' eaP' and 's' useful in debility, chronic rheumatism, con-<br>B.A., M.BjMön7ht <sup>A</sup> n <sup>eugSf</sup> & C'' ( <sup>Bri</sup> K <sup>au</sup> * Surgeon J. H. Thornton,<br>of Anantamal withWii ·? <sup>chronic</sup> cough and diarrhoea, the hot infusion<br>H milk and sugar acts as an alterative and tonic, specially<br>• 122                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Forms of Commercial Hemp. (¶«Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | HEMP.          |
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| in children" {Surgeon R. L. Dutt, M.D., Pubna). "Probably as inert as<br>Sarsaparilla itself" (Civil Surgeon C. M. Russell, Sarun). " I do not<br>think this medicine has any alterative properties" {Surgeon-Major<br>H< J. Hazlett, Ootacamund). " A very good substitute for Sarsaparilla but<br>not equal to it" (Apothecary T. Ward, Madanapalle, Cuddapak). " A<br>decoction of this drug alone has been found to be ineffectual as an altera-<br>tive in syphilis, unless combined with large doses of 10 grains of the Iodide<br>of (Potassium thrice daily" (Honorary Surgeon P Anderson, Guntur,<br>Madras). " Country Sarsaparilla is greatly used b) natives" (Surgeon'<br>Major L. Beech, Cocanada). "1 have seen the fresh inner and white root-<br>bark used with excellent results in syphilis" (Honorary Surgeon E. A.<br>Alfred Morris, Tranquebar). " An excellent substitute for Sarsaparilla.<br>Very useful in secondary syphilis in combination with Iodide of Potas-<br>sium" (Assistant Surgeon Shib Chunder Bhuttacharji, Chanda, Central<br>Provinces),<br>Trade.—The root in Bombay costs 4 annas per Ib, the high price being | MEDICINE,      |
| due to the difficulty of digging out the long roots from the stony ground<br>in which the plant "grows. (Dymock).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 123            |
| HEMIGYROSA, Blume; Gen. PL, /., j 9 S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
| A genus of trees with pinnate leaves, bearing comparatively large flowers,<br>in axillary branched racemes or panicles, belonging to the Natural Order<br>SAPINDACE/E and having three Indian species, of which one is ot economic<br>interest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |
| Hemigyrosa canescens, 77iw.; Fl. £r. Ind., /., 671; SAPINDACE-E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 124            |
| <ul> <li>Syn.—HEMIGYROSA TRICHOCARPA, Thw.; MOLINA A CANESCENS, Roxb.;<br/>SAPINDUS TETRAPHYLLA, Vahl; S. BIJUGUS, Wall.; CUPANIA CANES-<br/>CENS, Pers.; CUPANIA SP. Wall.; CUPANIA SP. 6, H.f. and T.</li> <li>Vern.—Lnkkandi, lokaneli, kurpa, MAR.; Nekota, karadipongan, TAM.,<br/>Korivi, bodda mdmidi, mum mdmidi, TEL.; Kdla-yatte, kurpah, karpa,<br/>KAN.; (the two latter Telegu names are given by Elliot, with the accom-<br/>panying caution that they are rather doubtful.</li> <li>References.—Roxb., Fl Ind., Ed. C.B.C., 320; Kurg, For. Fl. Burm., /.,•<br/>290; Beddome, Fl. Sylv., t., tsi; Gamble, Man. Timb.,93; Thwaites* En.<br/>Ceylon PI., S6, 408; Dale. &amp; Gibs., Bomb. Fl 35; Elliot, Fl. Andki<br/>29, 120; Lisboa, U. PI. Bomb., 50; Indian Forester, III., 201   Balfour"<br/>Cyclop., II., 34; Gaseteers.—Mysore and Coorg, /., 52; Bombay, XV</li> </ul>                                                                                                                                                                                                                                                             |                |
| Habitat.—A shrub or good sized tree, with a trunk which may be of considerable girth, but is not straight. It is found in Tenasserim and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |
| Burma, the Western Peninsula from the Konkan southwards, also common                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
| on the east side of the Madras Presidency, and in Ceylon near Kandy,<br>Structure of the Wood.—White, moderately soft, even grained, con-<br>taining no distinct heartwood According to the writer of the <i>Kd</i> ra<br><i>Gasetteer</i> , it is used in house-building. Roxburgh, however, writes : "the<br>wood is white and not so serviceable as that of Sapindus rubiginosus,"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | TIMBER.<br>125 |
| Hemlock, see Conium maculatum (Vol. II., 517).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |
| Kemp, Ambari, see Hibiscus canabinus, p. 34.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
| Hemp, Bombay, see Hibiscus canabinus, p. 34.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
| Hemp, Deccani, see Hibiscus canabinus, p. 34.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |
| Hemp, Indian, see Cannabis sativa, Vol. II., 103.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |
| Hemp, Manilla, see Musa textilis, Louts, Vol. V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |
| Hemp, Sunn, see Crotalaria juncea, Vol. II., 595.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |
| Н. 125                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | •              |

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| A Use | ful Fodder. |
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|                | Hetlbane, see Hyoscyamus niger, <i>Linn</i> , p. 319.                                                                                                                      |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Henna) see Lawsonia alba, Lamk. ; LYTHRACE2E.                                                                                                                              |
|                | <b>HEPTAPLEURUM</b> , Gartn.; Gen. Pl., 1,942.                                                                                                                             |
|                | Trees or tall shrubs often .climbing, with digitate, or digitately compound,                                                                                               |
|                | leaves, belonging to the ARALIACE^E. The genus comprises 14 or 15 Indian                                                                                                   |
|                | species, of which some are of value as timber trees. [ARALIACE-iE*                                                                                                         |
| 126            | Heptapleurum datum, C. B. Clarke; Fl. Br. Ind., II., 728;                                                                                                                  |
|                | Syn.—HEDERA ELATA, <i>Ham.;</i> AGALMA ELATUM, <i>Seem.;</i> ARALIAD, SP. 6,                                                                                               |
|                | Herb. Ind.Or. <sub>%</sub> H.f.&T.                                                                                                                                         |
|                | Van Griffithii^HEPTAPLEURUM GLAUCUM, Kurz; AGALMAGRIFFITHII, Seem.                                                                                                         |
|                | Vern.—Chinia, NEPAL ; Pronggam, LEPCHA.<br>References.—Kurs, For. Fl. Burm., I., S38 ; Gamble, Man. Timb^209 <sub>%</sub>                                                  |
|                | Habitat.—A.tree, from 30 to 40 feet in height, occurring on the Hima-                                                                                                      |
|                | laya, from Kumaon to Bhutan, between the altitudes of 5,000 and 7,000 feet.                                                                                                |
| TIMBER.        | The variety Griffithii is a native of Martaban and is found at similar                                                                                                     |
|                | altitudes.                                                                                                                                                                 |
| 128            | <b>Structure of the Wood.</b> —White, soft, even-grained.<br><b>H. impressum,</b> C. B. Clarke ; Fl. Br. Ind. <sub>9</sub> II., 728.                                       |
| -              | Syn.—AGALMA TOMENTOSUM, Seem. ; HEDERA TOMENTOSA; Ham; #A                                                                                                                  |
|                | AX TOMENTOSUM, DC. ; ARALIAD, SP. $i3 > Herb.$ Ind. Or., H.f. & r.                                                                                                         |
|                | Vern.—BaM chinia, NEPAL; Suntong, LEPCHA.                                                                                                                                  |
|                | <b>Reference.</b> — <i>Gamble, Man. Timb., 209.</i><br><b>Habitat- A</b> , handsome tree of the North-East Himalaya, from Ku-                                              |
| GUM.           | maon to Bhutan, between the altitudes of 6,000 and 11,000 feet. It is                                                                                                      |
| Bark.          | common in the forests of these regions, grows to the height of 00 teet, and                                                                                                |
| 129            | may be recognised by its woolly leaves.                                                                                                                                    |
| TIMBER.        | <b>Gum.</b> —The thick, brown BARK yields <b>a</b> copious gum ( <i>Gamble</i> ).                                                                                          |
| 130            | Structure of the Wood.—White or grey, and soft.                                                                                                                            |
| 131            | <b>H. venujpsum,</b> Seem. ; Fl. Br. Ind., II., 729 ; Wight, Ic, t. 118.                                                                                                   |
|                | Syn.—HEPTAPLEURUM ELLIPTICUM, Seem. ; PARATROPIA VENULOSA,<br>Wight & Am.; P. ELLIPTIC A and MACRANTHA, Miq. ; HEDERA VENOSA,                                              |
|                | Wall. ; H. TEREBINIHACEA, Wall. ; ARALIA DIGIT ATA, Roxb. ; SdA-                                                                                                           |
|                | DOPHYLLUM ELLIPTICUM, Blume.; AR/VLIAD, sp. i\$, Herb.Ind. Or. <sup>-</sup> , H. <sup>-</sup> f. & T.                                                                      |
|                | Var. macrophylla, <i>Wall.</i> * sp.                                                                                                                                       |
|                | Vern.—Dain, HIND.; Sukriruin, KOL.; Singhata, NEPAL; Biluletwa, ta-                                                                                                        |
|                | kya-lai-wa, BURM*<br><b>References.</b> —Roxb., Fl. Ind., Ed. C.B.C., 276 / Brandts, For. Fl., 249;                                                                        |
|                | Kure For Fl Burm / 538 · Aitckison Cat Ph and Sind PI 69 ·                                                                                                                 |
|                | Rheede, Hort. Mai., VII., t., 28; Atkinson, Him. Dist., 31 r; Indian<br>Forester, II., 23; XL, 370; For. Adm. Report, Ch. Nagpore, 1888,31•<br>Bombay Gazetteer, XV., 435. |
|                | Bombav Gazetteer, XV., 435.                                                                                                                                                |
|                | <b>Habitat.</b> —A small, glabrous tree, or evergreen climbing shrub, frequent                                                                                             |
|                | in the mixed forests throughout tropical and sub-tropical India, from the                                                                                                  |
| TRADED         | North-West Himalaya to the South Deccan and Singapore; common all over Burma.                                                                                              |
| TIMBER.<br>132 | Structure of the Wood.—Light-brown, soft.                                                                                                                                  |
| 134            | HERACLEUM, Linn.; Gen. PL, /., 92/.                                                                                                                                        |
|                | A genus of the UMBELLIFER <sup>^</sup> , of which several species grow in the Hima-                                                                                        |
|                | laya. One of these (undetermined), which is common in parts of the Panjab                                                                                                  |
|                | Himalaya from 8,500 to 11,000 feet in altitude, and is called by the Panjabis <i>"paddli"</i> or <i>"pordl,"</i> is described by Stewart as collected by the natives of    |
|                | Bashahr and Chamba for winter fodder; he further quotes Cleghorn to                                                                                                        |
|                | the effect that it is believed to increase the milk of goats fed on it. <i>{Panjab</i>                                                                                     |
|                | Plants, 107.) Mr. J. F. Duthie also gives Heracleum sp. as an article of<br>food for goats; see Rough List of Indian Fodder-yielding Trees, &c.                            |
|                | H. 132                                                                                                                                                                     |

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| Herba Bengalo; Sündri Wood. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | HERITIERĂ<br>littoralis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| The following are the determined species of the locality in which fodder plant is said to be collected :—<br>H. Jacquemontii, C. B. Clarke; H. Brunonis, Benth.; H. canesce Lindl.: H. candicans, Wall.; and H. nepalense, Don. {Fl. Br. Ind., 711—7/7.) Of these the two last are the most frequent, and it see probable that Stewart's H. sp. may be either the one or the other.<br>Herba Bengalo.<br>Several old writers, amongst others Linschoten, Mandelso, the Ab Guyon, Fitch, and Hamilton, give an account of a fibre obtained fr a plant under the above name, from which hangings, coverlets, &c.f w made. It is impossible, from the confused and contradictory description of these early travellers, to identify the plant referred to; indeed, it see probable that several the plant are plant under the descent of the confused and contradictory description of these early travellers, to identify the plant referred to; indeed, it see | ens,<br><i>II.,</i><br>ems<br>be*<br>om<br>vere<br>ons<br>ems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| probable that several fibre-yielding plants were indiscriminately cal "Herba Bengalo."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | lied                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Herb Christopher, see Actaea spicata, Vol. I., 103.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Herb Of Grace, see Ruta graveolens, Linn.; RUTACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| • HERITIERA, ^//.; Gen. PL, L, 219.<br>A genus of trees belonging to the STERCULIACE^E, comprising four or five                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ul> <li>allowed to be Indian by the Flora of British India, but since the publication of the first volume of that work Kurz has restored Heritiera macrophylla, Wall, to the position of a distinct species (New Burmese Plants, Journ. Asiat. Soc. Beng., XLI., pt. II., 291).</li> <li>Heritiera Fomes, Buck.; Fl. Br., Ind. I., 363; STERCULIACE-E. SynBALANOPTEKIS MINOR, Gtertn; HERITIERA MINOR, Roxb. Vern.—Súndri, sun dart, HIND.; Shundri, sundra, BENG.; Pinlekan BURM.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 506; KUTB, For. Fl. Su I., 141; Gamble, Man. Timb., fl; McCann, Dyes and Tans, Beng., I Balfour% Cyclop., II. S9; Mason, Burma and Its People, \$36, 753. Habitat.—A gloomy-looking tree, abundant in the Gangetic platestone.</li> </ul>                                                                                                                                                                               | rm.,<br>56 •<br>ain,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| extending inland to Sylhet, and along the shores of the Eastern Persula ( <i>Fl. Br. Ind.</i> ). Frequent in the tidal forests all along the Burn shores from Chittagong down to Tenasserim, ascending the rivers far as the tidal waves <i>{Kurz</i> }. According to Captain Munro it has gi its name to the Sundarbans— <i>Sundari-vana</i> or <i>ban</i> (Forest of the Sundarbans).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | as<br>as<br>ven :<br>larf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Dye.</b> —McCann writes, in his <i>Dyes and Tans of Bengal, "a.</i> specir<br>of the BARK has been forwarded from Nadiya as a dye-stuff, but with<br>any particulars."<br>Structure of the Wood.—Brown, strong, tough, and durable. It wei<br>66fc per cubic foot, and has a breaking weight of 1,132ft ( <i>Ku</i><br>Mason, in his <i>Burma and Its People</i> , writes : "It is the toughest wood thas been tested in India; when Rangoon teak broke with a weight of 8<br>Sundri sustained 1,312ft." Possessing these excellent qualities, it<br>natlirally much employed economically, especially in the manufacture<br>boats, piles of bridges, house posts, rafters, and other articles which hav<br>bear great weight. In Calcutta it is much used as firewood, and acco<br>ing to Dr. Wallich, it forms, when burnt, the best charcoal for the manu<br>ture of gunpowder.                                                                         | $\begin{array}{c c} \text{Bark.} \\ \text{Bark.} \\ 135 \\ 135 \\ \text{TIMBER.} \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 \\ 136 $ |
| H. littoralis, Dryand.; Fl. Br. Ind., /., 363.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 137                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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THE LOOKING-GLASS PLANT.

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Syn.-HERITIERA FOMES, Wall., in part; H. TOTHILA, Kurg (Contri-

H. 137

| HERITIERA            | Súndri Wood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HERITIERA<br>Papilio | butions towards a knowledge of the Burmese Flora); BALANOPTKRIS<br>TOTHILA, Geerin.<br>Vetil.—SUnder, sundri, BENG.; Sundri, BOMB.; Penglai-kanaso, Pinle<br>kanazo, BuRM.; Etúna, SING.; Mawtda, AND.<br>References.—JRoxb., FL Ind., Ed. C.B.C., 506; Kurz, For. Fl Burne,<br>I., 141; Gamble, Man. Timb., 47; Thwaites, En. Ceylon PL, 28; Dale.<br>& Gibs., Bomb. FL, 22; Rheede, Hort. Mai., VI., t., 21; Trimen,<br>Cat. of Flowering Plants, &c, of Ceylon, 12; Mason, Burma and It*<br>People, 536, 753; Indian Forester, II., 174/ VI., 292, #6* V <sup>in</sup> <sub>TY</sub> 4°* \<br>IX., 324; XI., 490; XII., 64, 329; XIII., 126; Balfour, Cyclop., H. 39 ><br>Gazetteers;—Mysore and Coorg, I., §8; Burma, I., 127.<br>Habitat.—A small, gregarious tree found on the coasts of Bengal,<br>the Eastern and Western Peninsulas, and Ceylon, extending inland as tar<br>as the Khasia Hills and Cachar. It is known to Europeans in some parts<br>of India as the Looking-glass tree, owing to the dense silvery 'hairs witn<br>which the under-surface of its leaf is covered.<br>Oil.—This TREE is reported to be the source of an oil in the Antilles,<br>the use of which is not known.                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | It is the chief timber of the Sundarban forests. Its reproduction is most<br>favourable. On all lands flooded by ordinary flood tides, a new growth<br>of jungle springs up immediately; but on land ordinarily above high-<br>water mark, it only establishes itself by slow degrees. It soon spreads<br>on newly formed islands on the sea edge of the forests. The Sundrt<br>forests are generally very well stocked; thus valuations made by Morri-<br>in 1873-74 gave the average amount of material per acre of forest, as<br>follows :—seedlings and saplings under 3 feet girth, 2,487; trees above<br>3 feit girth 182'' (Gamble). The above description resembles that given by<br>Kurz for the wood of H. Fomes, while his account of that of H. littoralis<br>differs considerably- He writes: '' Wood brown, rather light and close-<br>grained.'' This account is confirmed by the Burma Gazetteer, /., 127*<br>where it is reported ''Peng-le-ka-na-tso (H. littoralis) is found in the tidal<br>forests, and yields a brown, light, and rather loose-grained wood, used<br>locally for house posts and rafters and for firewood by salt boilers.'' It<br>seems probable that some mistake exists as to the exact botanical source<br>of the Sundri wood of the Sundarbans. Both H. Fomes and H. littoralis<br>seem equally frequent; they appear to have the same vernacular names,<br>and have almost exactly the same habitat, all of which circumstances<br>would render confusion very possible.<br>It is worthy of notice that Mason, in his Burma and Its People, fully |
| trade.<br>140        | describes H. Fomes under the vernacular name of <i>Sundri</i> , and, on the other hand, leaves the timber of H. littoralis, with which he seems unac-<br>quainted, undescribed. It is impossible with the present literature on the subject to determine where the error lies, but it is to be hoped that further information may be forthcoming.<br>Trade.—In the Forest Progress Report for Bengal, 1881-82, it is men-<br>tioned that <sup>u</sup> niore than a lakh of rupees was received on <i>Sundri</i> wood (H. littoralis)." This indicates a very large consumption, which its highly useful event                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 141                  | useful qualities would seem to warrant.<br>Heritiera Papilio, Beddome, Fl. Sylv., /, 218; FL Br.Ind., I.,3 <sup>6</sup> 3-<br>Vern.—Soundalay *'inna, TINNKVKLLY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                      | <ul> <li>References.—Gamble, Man. Timb., 48; Indian Forester, III., 23 s Bal-<br/>fou<sup>^</sup> Cyclop., II., 39.</li> <li>H. 141</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| A roweriu Dephatory. (J Murruy.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | CRPESTIS                                   |
| Habitat.—A very lofty tree in the evergreen forests of Travancore<br>and the Southern Carnatic. at Courtallam and Tinnevelly.<br>Structure of the Wood.—Red, very hard, similar to that of H. littora-<br>lis, but pores less numerous and smaller. It weighs 631b per cubic<br>foot, and is used for building, cart poles, and agricultural implements. In<br>Vol. III. of the <i>Indian Forester</i> it is given in a list of the most valu-<br>able timbers of the Tinnevelly District.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TIMBER.<br>14.2                            |
| [1873, 61; Trim. Journ. Bot., 18J4, 66, f. 7.<br>Heritiera macrophylla, Wall.; Kurz in Journ. As. Soc, Beng.,<br>Habitat.—Upper Tenasserim and Martabs.n. No information exists re-<br>garding the timber of this tree, nor of its economic uses, but as it has up to<br>a recent^date been confused with H. littoralis, <i>Lryand.</i> , it seems probable<br>that its wood may resemble the timber of that tree in structure and qualities.<br>HermodactylllS, see Colchicum sp., Vol. II., 501.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 143 ·                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                            |
| <ul> <li>HERNANDIA,Z*&gt;///.; Gen. PL, III., 164.</li> <li><sup>6</sup> A genus of evergreen trees belonging to the Natural Order LAURINEJE, and</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                          |
| comprising eight species, all tropical, of which one is Indian.<br>[/. /#55/ LAURINEIE.<br>Hernandia peltata, Meissn.; Fl. Br. Ind., V., 188; Wight, Ic,<br>Syn.—H. SONORA, Linn, in part.<br>Vern—Uparanthi, MYSORE; Palati,paintU, SING.<br>References—Kurz, For. Fl. Burm., II., 309; Beddome, FL Sylv., t.<br>300; Gamble, Man. Timb., 304; Thwaites, En Ceylon PL, 258; Trt-<br>men, Syst. Cat. Flowering PL, &c, Ceylon, 76; Indian Forester, VI.,<br>u xJi <sup>8</sup> ; B <sup>al</sup> f <sup>our</sup> > Cyclop., II., 40; Treasury 0/Bot., I., tf5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 144                                        |
| - Habitat.—-An evergreen tree, with peltate leaves, found in the coast forests of Singapore, the Andaman Islands, and Ceylon.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TIMBER.                                    |
| fifth $\frac{1}{100}$ | 145<br>MEDICINE.<br>Juice.<br>146<br>Bark. |
| HERPES/TIS, Gartn.f. ; Gen. PL, II, 9J/.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Leaves.                                    |
| A genus of glabrous, often punctate, herbs, with yellow, blue, or white<br>flowers. belonging to the Natural Order SCROPHULARINEZ. It: comprises about<br>so species, all provide of warm countries, but of these only three are known<br>$-u_c$ Indianr " $7$ "" """"" [PHULARINE].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | I48                                        |
| Herpestis MonnL <sup>^</sup> , H. B. & Kth., FLBr. Ind., IV., 272; SCRO-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 149                                        |
| <b>Syn.</b> —Herris SPATHULATA, Blume; GRATIOLA MONNIERA, Linn.<br>Vern. 2014, brahmi, jal-nim, shwt. <sup>c</sup> * <sup>fIWW</sup> ^* <sup>t</sup> ?^^JJJJJ <sup>lf</sup> '''o''issA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |
| f£!!^ii^^S; ii T*Z <sup>S</sup> , "¥ambrdni chettu,<br>TEL, .'Beami, 'MAT AV • M^nh.ffüm fftHftiduktm &ANS»                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
| f A t f<br><b>gol</b> Thwaites, <sup>E</sup> ~ $C^{\Lambda^{T}TMP^{I}} 2^{I8}$ , $V^{6} > {}^{D}S \setminus *'? 2 \cdots ? ff > y'' * *' *'$<br>AitMson, Cat. Pb. and Sind PL, 107; $g^{TM^{6}*} > F^{\circ}rtMaL, X., t.i^{4}$<br>T-men , Syst. Cat. Cey. PL, 62.: Elliot, Fl. Andhr., 166; Pharm. Ind.,<br>5? / Ainslie, Mat. Ind., II., 23?; VShaughnessy, Beng Dispens, 476:<br>TI C Dutt, Mat Med.Hind., 2i3, 294; Dymock, Mat. Med.W. Ind.,<br>2nd Ed., 579; \$• Arjun, Bomb. Drugs, 99; Bidie, Cat. Raw Pr., Paris<br>Fxh. No. 620; Year Book, Pharm., 1874, ^5; Atkinson, Him. Dist., 314,<br>730''PDrury, U.PL.242; Balfour, Cyclop., II., 42; Treasury of Bot., I.,<br>SSs '• Gazetteers: -Bombay, III., 204; Mysore and Coorg, I., 56; Orissa,<br>II., '159; NW. P., /., S3; IV., Ixxv.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |
| • 15 H. 149                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                            |
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**22**<sub>5</sub>

| HETEROP<br><u>adenop</u> l                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE.<br>Root.<br>WO<br>Stalks.<br>5<br>Leaves.<br>152<br>Juice.<br>153 | r i? <i>White</i> — A an nual creeping plant, found in moist place<br>of we work of tanks, throughout India, from the Panjab t<br>MP, ?: ascendin? <sup>to</sup> an altitude of 4,000 feet.<br>, r. /' on j. — Ainslie informs us that the JOINTED ROOT<br>fi, ft <sup>nd</sup> , LEAVBA are used medicinally by the Hindus<br>them to be diuretic and aperient, and particularly useful in<br>stoppage of urme which is accompanied by obstinate costiv<br>aurgh wrote: ' The natives used the expressed JUICE mis<br>if j f. Upn parts affected with rheumatic pains.'' U. O<br>'' !**!'. MatenaMedica, affirms that it constitutes the brakmi<br>physicians, and assumes that it is also the brakmi of Sa<br>ne, writes: 1 his plant is considered a nervine tonic, usef<br>pilepsy, ind hoarseness. Half a tola of the fresh juice of t<br>i o scrue as of pathak c F^. and honey, is recommended to be<br>slnity. Vi up parts affected in clarified butter are taken to re-<br>nes f. 5 ? 1 k urmever, thinks that Dutt may be mi<br>tak. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. 5 ? 1 k urmever, thinks that Dutt may be mi<br>tak. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. 5 ? 1 k urmever, thinks that Dutt may be mi<br>tak. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. f. f. evcs fruced in clarified butter are taken to re-<br>nes f. | as well as<br>s, who consider<br>in "that sort<br>veness." Revealed with pet<br>C. Dutt, in I<br>ai of the nat<br>anskrit write<br>ful in. insani-<br>the 1? aves, we<br>be given in the<br>at in Bomb<br>under con<br>of India give<br>lently regar-<br>tice of its val-<br>rived from<br>bly due to<br>ineral ppison<br>I of the J"r? |
| 154                                                                         | Officer, Serampore).<br>HETEROPANAX, Seem.; Gen.PL,I, 945-<br>Heteropanax fragrans, Seem.; Fl. Br. Ind., II., 734,<br>Syn.—PAN AX FRAGRANS, Roxb.; ARALIAD SP. 47, Herb.<br>MERCHA; Tachansa, RURM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ; ARALIACE<br>Ind. Or. ^'/*'<br>AL ; Sirtokhte                                                                                                                                                                                                                                                                                          |
| TIMBER.<br>155<br>DOMESTIC.<br>156                                          | References. — Roxb., Fl. Ind., Ed. C.B.C., h66; Brandts<br>Kurs, For. Fl. Burm., I., 541; Gamble, Man. Timb., 20<br>Shrubs and Climbers, Darjeeling Dist., 44; Atkinson, H<br>Indian Forester, V., 212; Balfour, Cyclob., 11., 42; Apli<br>Shan States; Special report on Econ. Pl. of Assam.<br>Habitat.—A small unarmed tree, found from-the Se<br>Burma, and common in Bengal. It grows to an a for under<br>Structure of the Wood.—Light brown, or grey, ther<br>its being employed economically.<br>Domestic Uses.—This tree is important as being that on<br>which the "Eri" silkworm is fed in Upper Assam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | walik Hills<br>f 4,000 at.<br>heavy, aro<br>is no record                                                                                                                                                                                                                                                                                |
|                                                                             | HETEROPHRAGMA, $DC$ , $<::, p,, n$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                         |
| <b>157</b>                                                                  | Heteropi<br>SzBIGNONtA ADBNOPHYLLA, Wall.,- SpATHODEA AD<br>VernPetthan, BURM.<br>ReferencesKurs, For. Fl. Burm., II., 236; Gamble, M<br>Aplin Report on the Shan States.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                         |

| I II P O D P A C UT CASS $I I = 0 D D D D D D D D D D D D D D D D D D$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ROPOGO                                             |
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| <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | tortus.                                            |
| Habitat.—A moderate-sized deciduous tree met with in Burma, Assam,<br>Eastern Bengal, and the Andaman Islands.<br>Structure of the Wood.—Yellowish-white, moderately hard. Weight<br>41ft per cubic foot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | timber.<br>158                                     |
| •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                    |
| Heterophragma Roxburghii, DC. / Fl. Br. Ind., IV., 381.<br>Syn.—SPATHODEA ROXBURGHII, Spreng.; BIGNONIA QUADRILOCULARIS,<br>Roxb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 159                                                |
| <ul> <li>Vern.—Pullung, warras, BOMB., MAR.; Ba:o-kala-goru, TAM.; Bondgu, TEL.</li> <li>References.—Roxb., Fl.Ind.,Ed. C.B.C., 494; Brandts, For. FL, 350; Bed dome, For. Fl., t. i6p; Gamble, Man. Titnb., 277; Dais. &amp; Gibs., Bomb. FL, 160; Dymock, Mat. Med. W. Ind., 2nd Ed., \$44S Lisboa, U. PL Bomb., 105; Birdwood, Bomb. Pr,9 333; Indian Forester, XII., 312; Bomb. Gazetteer, XIII., pt., /., 27.</li> <li>Habitat.—A large tree met with in the Chanda district, Godaveri forests, and the West Deccan Peninsula generally, from Bombay southwards.</li> <li>Fodder.—It is stated in the Thana Gazetteer that the "LEAVES are much eaten by cattle.</li> <li>Structure of the Wood.—Grey, rough, moderately hard. Weight 40ft per cubic foot. It is employed in Bombay and Madras for the manufacture of planks, and for building purposes generally.</li> <li>H. sulfureum, Kurz; Fl. Br. Ind., IV., 381.</li> <li>Vern. TM*Thitlinda, BURM.</li> <li>References.—Kurz, For. Fl. Burm., II., 234/ in Jour. As. Soc, 1873, Pt. II., 90; Gamble, Man. Timb., 27j.</li> </ul> | FODDER.<br>Leaves.<br>160<br>TIMBER.<br>161<br>162 |
| Pegu Yomah.<br>Structure of the Wood.—Dark-grey, soft, even-grained, resembling in<br>structure that of H. Roxburghii. Weight from 40 to 60ft per cubic foot.<br>Though no account is obtainable of this wood being employed for economic<br>purposes, it seems probable from Gamble's description, that, like that of<br>the former species, it might be used for planks and building.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | timber.<br>163                                     |
| HETEROPOGON, Pers.; Gen. PI., M., 1033.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                    |
| A genus belonging to the tribe ANDROPOGONE <sup>A</sup> , of the Natural Order<br>GRAMINEJE. It comprises five or six species, all inhabitants of warm countries,<br>one of which, the well known Spear Grass, is common all over India.<br>[Northern India, 32; GRAMINE <b>E</b><br>Heteropogon COntortUS, R. cV S.; Duthie, Fodder Grasses of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | I64                                                |
| THE SPEAR GRASS.<br><b>Syn.</b> —Heteropogon Hirtus, <i>Pers.;</i> H. Roylei, <i>Nees.;</i> Androfogon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                    |
| CONTORTUS, Linn.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    |
| Vern.—Kker, BENG.J Sauri gkds, SANTAL; Badapuncha, lamp <sub>M</sub> lampa,<br>lampar, parba, parbi, BUNDEL.; Kanura, sarwala, paraura, riskawa,<br>parba, banda, sarwar, musel, lap, banda, NW. P.; Barwesa, sarwal,<br>TKANSIND.; Suriala, snrari, sarwala, suriala, lamb, PB.; Sarwala,<br>RAJ.; Pochati, saga, BERAR; Hukara gadi, kusal, kusdli, khar, lum-<br>pen, C. P.; Yeddi, iddi, shervu <sub>%</sub> TEL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                    |
| <ul> <li>References.— Voigt, Hott. Sub. Cat., 706; Stewart, Pb. PL, 255; Aitchison, Cat. Pb. and Sind PL, 176; Duthie,-Indig. Fodder Grasses of the plains of N. W. Ind., 19, pi. xix.; Symonds, Grasses of the Ind. Peninsula, 44, pi. 29; Elliot, Fl. Andhr., 49; Atkinson, Him. Dist., 321; Indian Forester, XII, App. 2; Maiden, Useful Native Plants of Australia, go; Coimbatore District Manual, 198; Nursingpore Settlement Report, 57; Gazetteers:—NW. P., I., 85; IV., Ixxx; Panjdb, Kama I Dist., 19.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                    |
| Habitat.—An erect, glabrous grass, with hygrometric awns, found grow-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                    |
| ing in tufts on rich pasture ground. Duthie writes : " Common both in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>I</b>                                           |
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| HIBIS  | CUS  |
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| IIIDIS | CUS. |

FIBRE.

165 FODDER.

166

| Malvaceous | Fibres. |
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the plains and on the hills of the Panjab and North-West Provinces. It grows in light soil about Banda, attaining a height of about 3 feet; in soil mixed with kunkur (*rakar*) it reaches 55 feet in height (*Miller*). It is coirmun on the rock tablelands of the hilly country south of Allahabad (*Benson*). Abundant also on the warm lower slopes of the Himalayas, and up to an elevation of 7,000 feet in some parts."

Fibre.—The grass is used as a fibre in the manufacture of coarse mats, &c.

Fodder.—It is largely used as fodder both before and after it nas flowered, but chiefly when it is young and tender. In Rajputana and Bundelkhand, where it constitutes the principal fodder grass, it is cut ana stacked after the rains, and will, it is said, keep good in stack for twelve years. On Mount Abu the people consider it the best fodder grass tifey have (*Duthie*). Symonds mentions that it is good fodder, when green, for cattle and horses, and Maiden, in his Useful Native Plants of Australia,  $wp^{1} \wedge, ^{1}$ , "A splendid grass for a cattle run, as it produces a great amount of feed: In the Settlement Report of Nursingpore, on the other hand, the grass is said to be "almost useless, as even horned cattle object to it when they can get anything else." This observation probably refers, however, to trie plant which has been allowed to seed before it has been cut, in which condition its hard spear-like awns are naturally objectionable.

DOMESTIC.

167

Domestic Uses.—It is much employed in many parts for thatching. Hevea braziliensis, *Müll. Arg.*, see India-rubber, p. 365.

## HIBISCUS, Linn.; Gen. PL, /., 207, 982.

A genus of MALVACEAE, including some 33 Indian indigenous, and several introduced, cultivated species, many of which are of considerable economic value, while nearly all might be utilised for the fibres they contain. Regarding the confusion which at present exists owing to the indiscriminate application of th&name HEMP to plants of this genus, Dr. Watt, in the "Selection-, from the Records of the Government of India, Revenue and Agricultural Depaitment, Volume 1., "states: "So much confusion exists in the writings of Indian authors regarding the word \* Hemp' that it has been deemed desirable to make an effort to establish a more trustworthy mode of expression. It would, indeed, have been to the advantage of Indian commerce at the present day had Dr. Royle's remark on this subject, made nearly half a century ago, been carefully observed. He wrote : 'We should avoid calling every new fibre *Hemp*, when one only can properly be so named. In the same way, the Southsea Islanders called every new animal they saw a pig, because that was the only one with which they were acquainted.' The true hemp of European commerce is of course Cannabis sativa, a plant allied to the nettle, but having a leaf deeply cut into the shape of a hand (palmi-partite). The flowers of the hemp plant are small, green, and insignificant-looking—the males appearing on one individual, and the females on another. The Sunn-hemp of Indian commerce, sometimes called Brown-hemp, is Crotalaria juncea—a plant that belongs to the pea-family, and has large showy yellow flowers. Bombay-hemp and Deccani-heinp (and also, as sometimes, though incorrectly, called Rosellehemp—the true Roselle being Hibiscus Sabdariffa), are terms often used loosely, but which should, in all probability, be restricted to Hibiscus cannabinus, the hemp-leaved Hibiscus (ambdri). In point of foliage this plant\* closely resembles the true hemp (hence its botanical specific name), but in no other respect. The stems are slightly prickly, as also the sepals, and the flowers are large and yellow, with a deep purple centre. Any one who has seen a cotton plant in flower, or the common garden shoe-flower, could never for a fibres obtained from these plants is so disfigured through the application to all three of the  $p^{opu}[$ <sup>ar</sup> word 'hemp,' that it is often qi te impossible to discover to which ai! KII  $V^{\wedge}$  alluding. These plants not only differ materially from each other ?i'. 'He<sup>ir more</sup> f,'<sup>re</sup> entirely different, and any attempt to sell the one in place of the other would have serious effects on the development of bade. H. 167

| The Musk Mallow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | HIBISCUS                                                                                                                                                                                                                            |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (0. 111111111111111111111111111111111111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | helmoschus.                                                                                                                                                                                                                         |
| The Ambari is of course a bast fibre, and is thus more nearly<br>to Minn-hemp or to true hemp. The latter is more nearly<br>to either of thi others. Indeed, these three fibre-yiel<br>accepted as the types of three of the most important class<br>fibres, the nettle fibres, and the pea-fibres. Commercially<br>nearly allied to flax than to hemp, and as stated, Bomb<br>more reason be returned as a for.n of jute than of hemp."<br>It is to be hoped that this distinction will be observed<br>that the word " hemp " may be restricted to <b>Cannabis sa</b><br>referred to the article on <b>Cannabis sativa</b> —hemp—and<br><b>laria juncea</b> —sunn-hemp—for further particular regardi<br>It may be here added that the term Manilla-hemp is given<br>to the fibre of <b>Musa textilis</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | y allied to rhea than<br>lding plants may be<br>es ot fibres,—the bast<br>, sunn-hemp is more<br>bay-hemp might with-<br>by future writers, <b>and</b><br><b>tiva.</b> The reader is<br>l to that on <b>Crota</b> -<br>ing these two fibres.<br>in modern commerce                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                     |
| Hibiscus Abelmoschus, Linn.; FL Br. bid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                     |
| THE MUSK MALLOW.[]Syn.—ABELMOSCHUS MOSCHATUS, Manch ; HIBISH. SPATHACKUS, Wall.; H. RICINIFOLIUS,<br>Wall.; H. SAGITTIFOLIUS, Kurs.The Flora of British India distinguishes two forms :—<br>Var. 1, multiformis;—BAMIA SP.; Wall., Cat., 1917                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Wall.; H. CHINENS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | n. ;                                                                                                                                                                                                                                |
| <ul> <li>Van 2, betulifolius ;—BAMIA SP. ; Wall., Cat., 1918.</li> <li>Vern.—Mushk-dana, HIND.; Mushak-dana, BEI DEK.; Mishk-ddna, mushk-bhendi-ke-biji; Guz.; Kasturi-vendaik-kayvirai, kattuk-kastiri vittulu {nela benda, Elliot), TEL.; Kdttu-ka MALAY.; Ba-lu-wa (Mason, contradicted BURM.; Zatdkasturikd (lata-kasturikam, Moo Habbul-mishk, habbul-mushk, ARAB.; Mushk-da References.—/?*#£., FL Ind., Ed. C.B.C., S20 PI., 27; Aitchison, Cat. Pb. and Sind PI., PL &amp; Ferns, &amp;c, Ceylon, u; Rheede, Hort &amp; A., Prodr., I., 53; Elliot, FL Andhr., phia Indica, I., 209; Ainslie, Mat. Ind., II., Supp, Pharm. Ind., 13; Mat. Med. of Madras, Med. Hind., 123; Dymock, Mat. Med. W. In Dispens., 15th Ed., 1664; Murray, PL and Dey, India Drugs, Ind., 60; Royle, Prod. Res. &amp; *33<sup>2</sup> ! Atkinson, Him. Dist., 306; Drury; U 259, 268; Liotard, Paper-making Mat., 17; Pi son, Burma and Its People, 418; Rep. Agri. 21; Smith, Die, 2S0; Gazetteer, NW. P., IV Habitat.—A herbaceous bush, springing up with in the cold season. Leaves of various shapes; t cordate; the upper narrow, hastate, very hairy. the hotter parts of India, now met with in most othe Fibre.—Like other species of this genus this plan stem. Dr. Roxburgh, experimenting with cords m wetting made no difference in its breaking point required to break the rope whether wet or dry being Report of the Agricultural Department, Bengal, fo is given of a series of interesting experiments with by the AgriHorticultural Society of India at the rement of India. H. Abelmoschus yielded the best yielding plants experimented with, and, with a Dearchine, 800fb of fibre was obtained as the yield per a system of retting, on the other hand, a yield from corresponding to 12 maunds 17 seers per acre was o</li> </ul> | BOMB.; Mushak-da<br>, TAM.; KasMri-beu<br>usturi, kasturi-venta-vi<br>by Moodeen Sheriff<br>odeen Sheriff), SAN<br>ma, PERS.<br>6; Thwaites, En. Cey<br>20; Trimen, Cat.<br>4: Mai., 11.9 t. 38;<br>84, 131; Phar,nacog<br>72, 33s; Moodeen Sher<br>52; U. C. Dutt, M.<br>d., 2nd Ed., 102; U.<br>Drugs, Sind, 63; K.<br>, 230; Baden Powell,<br>2. J. C. Bergal, 1886-<br>7., Ixviii.<br>the rains and flower<br>the lower broad, ova<br>Common througher<br>the lower broad, ova<br>Common througher<br>the lower broad, ova<br>Common througher<br>the average weig<br>1071b. In the Annur<br>r 1886-87, an accound<br>this fibre, conduct<br>quest of the Gover<br>crop of all the fibr<br>th and Ellwood's macre. By the ordina<br>the non-seeded pla | na,<br>da-<br>tta,<br>f),<br>S.;<br>lon<br>FL<br>W.<br>Ta- iff,<br>lat.<br>S.<br>L.<br>Pb,<br>PL.<br>Aa-<br>87,<br>ing<br>tte,<br>put<br>its<br>FIBRE.<br>169<br>169<br>161<br>161<br>169<br>169<br>161<br>169<br>161<br>169<br>169 |

| HIBISCUS<br>belmoschu                   | IS The Musk Mallow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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|                                         | arrived at the conclusion that the cultivation of Hibiscus had no advantage<br>over that of Jute.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| PERFUME <sup>1</sup> .<br>Seeds.<br>170 | Odorous Principle.—The SEEDS yield about 6£ per cent, of an odorous principle and resin. The former is a light green non-volatile fluid having a strong odour, resembling that of a mixture of musk and amber, hence the Arabic name hab-ul-mushk. Owing to their possessing this principle, the musk mallow seeds are used in perfumery, and are known to the trade in Europe as "Grains d'ambrette." Piesse, in his Art of rer. fumery, writes: "Musk seed, when ground, certainly reminds our $^{STM^e}$ ing sense of the odour of musk, but it is poor stuff at best, " and no recommends it only for making cheap sachet powder. According to nor the most valuable seeds are imported from Martinique.—(See Article "Mush," Vol. III., 58 to 62.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MEDICINE.<br>Seeds.<br>171              | Medicine.—The aromatic brown SEEDS are employed medicinally by<br>the natives of Northern India. They are kidney-shaped, with a hilum<br>in the concave border, slightly compressed, striated, about two lines in<br>length, and have a feeble odour of pure musk, which becomes more<br>powerful on rubbing them together or between the fingers. By attention<br>to these characters they may be distinguished from the seeds of Psoralx'<br>corylifolia, which are used as an adulterant or substitute in Madrass<br>Arabic and Persian writers regard their therapeutical properties as cold<br>dry, tonic, and stomachic, an opinion which is still held by the Hinduss<br>The author of the <i>Makhzan-el-Adwiya</i> recommends a mucilage made from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Root.<br>172<br>Leaves,<br>173          | the ROOT and LEAVES in gonorrhoea. Though no part of the $pl^{ant}j$ recognised as of value by the Pharmacopoeia of India, Moodeen Sheriff in his <i>Materia Medica of Madras</i> , regards the seeds as stimulant, stomachic and antispasmodic, and recommends their exhibition in cases of $nerY^{ol}Y$ debility, hysteria, atonic dyspepsia, and a few other conditions in whic musk is indicated. He writes that the best and most efficacious metho of usisg the drug pharmaceutically is as a tincture, an account of the section o |
|                                         | preparation and usage of which will be found in his short note below<br>SPECIAL OPINIONS.—§*• The seeds of Hibiscus Abelmoschus or <i>Mushi</i><br><i>ddnah</i> contain albumen, oil, and a peculiar principle on which their odou<br>depends. They are stimulant, stomachic, and antispasmodic, and prove use<br>ful in some nervous affections in which musk is indicated. The seeds at<br>best administered in tincture, which is prepared as follows :—Take of th<br><i>Mushk-ddnah</i> in powder, two ounces and a half; rectified spirit, one pin<br>Macerate the seeds for forty-eight hours in fifteen fluid ounces of th                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         | spirit, in a bottle, agitating occasionally; then transfer to a percolate<br>and, when the fluid ceases to pass, continue the percolation with the<br>remaining five ounces of spirit. Afterwards subject the contents of the<br>percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit, to make one pint. Dose, from one drachm to two<br>drachms. In more than three drachm doses it produces headache or gide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                         | ness'' (Honorary Surgeon Moodeen Sheriff, Khan Bahadur, G.M.M.<br>Trifrlicane, Madras). <sup>1f</sup> The juice of the fresh plant is used as a febr<br>fuge and expectorant in domestic medicine, and a poultice made 01 t<br>whole plant reduced to pulp is applied to the chest in bronchiti<br>(Assistant Surgeon Sakharam Arjun Ravat, L, M., Girgaum, Bombay<br>'' Emollient and demulcent. Used as a cooling drink in fevers, gonorrho<br>&c, and as an inhalation in hoarseness, dryness of the throat, &c<br>$\{\bar{C}ivil Surgeon J_{\%} H. Thornton, B.A., M.B., Monghyr)$ . '' Useful                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| FOOD.<br>Seeds.                         | acute gonorrhoea" (Surgeon-Major G. Y. Hunter, Karachi).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 174                                     | <b>Food</b> —Ainslie mentions that the SEEDS are mixed with coffee Arabia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Products of Intilia-

The Deccan Hemp.

RIBISCUS

|                                                         | The Deccan Hemp.                                                          | <u>(J. Миттау.)</u>                  |         |
|---------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------|---------|
|                                                         |                                                                           |                                      |         |
| Domestic Uses.=Th                                       | ne LEAVES are said by Royl                                                | e to be europed in the               | WSBBBBm |
| North-Western Provinc                                   | cs to clarify sugar.                                                      | Kalo of I-di-                        |         |
|                                                         | <u>do not now form an art</u><br>the West Indies fe <u>tch abo</u>        | ut 6d and Bin I where                |         |
|                                                         | the west mules totti abo                                                  | ut oar pet to in London              | 170 ==  |
| (Dymock).                                               | The El De La I                                                            |                                      |         |
| Hibiscus cannabinus                                     | <u>, Linn.; Fi. DF. Ina., I.,</u>                                         | 339-                                 |         |
|                                                         | Ambari Hemp.                                                              |                                      |         |
| SynH. WIGHTI                                            | ANUS, Wall.                                                               |                                      |         |
| Vern. — Ambári, pá                                      | itsan, pulu, ndlith (Conf. with                                           | C. 1861 in the Dictionary)           |         |
| ninp.; mesta y                                          | bát (ambya pát, the leaves, s<br>r. B. Hamilton), Bang.; D                | no <i>chanaana</i> , the plant       |         |
| Hindus of Chut                                          | is-NECTURE, SANTAL: KOMM                                                  | and Aussey & Andrews                 |         |
| BEHAR; Patsan,                                          | -pitwa, rattia san (tukhm-i-bh                                            | ang at DELHI), NW. P.                |         |
| Shan (in Jhelam                                         | basin), <i>sankokla, patsan, sa</i>                                       | in kokra, sinjubárá, Px.             | ;       |
| Sujjado (accord                                         | ing to Stocks), SIND.; Am                                                 | bari (in CHANDA), C.P.               | ş       |
| <u>Atnbdri, BOMB.</u>                                   | ; <u>Atnbada. MAR. ; Pulimani</u>                                         | <u>ų, bulichi* bulicharkirai</u>     |         |
| paiungu, 1 AM.;                                         | Góngúra (according to Elllo<br>Pundrike gida, holada, KAN,                | t), gaynara (GODAVERI)               |         |
| Suiteda (2000-1:                                        | runarike giau, noiaaa, NAN.<br>ng to Stocks). Pers.                       | j cump, <b>zernism</b> ra, JANS,     |         |
|                                                         | b., Fl. Ind., Ed. C.B.C., 528 ;                                           | Voigt Nort Sub Cal                   |         |
| <u> </u>                                                | In. Ceylon Pl., 401; Stewart,                                             | Pb. Pl., 22; Aitchison               |         |
| Cat. Pb. and Sin                                        | id <u>Pl., 20 : Druty, Handbook</u>                                       | Fl. Ind., I., 71 ; Camp              |         |
| <u> </u>                                                | con. Prod. Chutia Nappue, 17<br>lens, Bangalore, by J. Camer              | <u>; Eikol, Fl. Andhr., 6r</u>       |         |
| <u> </u>                                                | 190; U. C. Dutt, Mat. M.                                                  | ed. Hind. 211 - Dymoel               |         |
| Mat Med. W. 1                                           | nd., and Ed., 104: Pharmac                                                | CE. ING. I. ALL MAL                  |         |
| in Selections fr                                        | om the Rec. of Govt. of Inc                                               | d., Rev. & Agri. Dept.               |         |
| 1., <u>266<del>; H. C.</del></u><br>Pomull Ph Pr.       | <u>Kerr, (Cuitvn. and trade in</u><br>332; Atkinson, Him. Dist            | t 700 : Drury, U. Pl.                |         |
| 243 : Duthie &                                          | Fuller, Field and Garden                                                  | C <del>rops, 86; Lis</del> boa, U.Fl | <u></u> |
| churching alors ; arriver                               | 16, 17, 28, 34; Cross, Bevan, A                                           |                                      |         |
| Indian Ribres At                                        | ; Mueller, Extra-trop. Pl., 1                                             | ct Manual Caimbara                   |         |
| Dist., Madras,                                          | 238 : Manual of Trichinopoly<br>5 : Settlement Reports : C. P             | by Moore, 1; Madra                   |         |
| <u>Manual, 313, 360</u>                                 | o; Settlement Reports:—C. P                                               | <u>, Godavery, 35; Chunda</u>        | ·       |
| 83; Panjáb, Kan                                         | 1gra, 25; Montgomery, 107; 1<br>1ssa, 11., 176 and App. VI.; 1            | NW. P., Azamghar 118                 | i       |
|                                                         | by Madden, 280; Spons, Ency                                               | Clab., Of Shartal Valum              |         |
| of Madras Selection                                     | ns on Fibres ; Report of Direct                                           | tor of Land Rec. and Agri            | - }     |
| cut., Bombay, 1885                                      | 5-86, App.XII. ; 1886-87, ApfiX                                           | II. ; <u>1887-88, App. XII</u>       | ·       |
| HabitetA small_                                         | herbaccous shruh, ATOITE                                                  | nity wild east of the                |         |
| Northern Ghats, but lar                                 | gely cultivated for its fibre                                             | throughout ///adia, the              |         |
| produce <u>peing used by</u>                            | the agricultural classes loc                                              | ally, <u>It is more spect</u>        |         |
| Bamban and loss abund                                   | Nagpúr, the Central Pr<br>antly in the North-West Pr                      | outpoor Quit and the                 |         |
| Dombay, and less abund:                                 | of the last-mentioned provin                                              | that AAAa antis and                  |         |
| Toman an the lower                                      | Himálaya, ascendiramffi                                                   | The feet in siting and               |         |
| Ballow renorta ite avieta                               | nee near Ghazni at about 7                                                | Geo teel immsM-wasen                 |         |
| It will be observed                                     | that the vernacular name                                                  | eren to this plantan                 |         |
| the western, southern, ar                               | nd central parts of India                                                 | have a more original                 |         |
| character than t <del>hose in t</del>                   | use in Bengal, the North-V                                                | Vestern Provinces, and               |         |
| the Paniáh. In the lat                                  | ter areas it is generally eq                                              |                                      |         |
| or to lute. This fact mi                                | oht be accepted as pointing                                               | <u>e to its being a native</u>       |         |
| of the former rather th                                 | an of the latter division (                                               | of India. The plant is               |         |
| chiefly grown for its fil                               | bre, but occasionally, as in $\Delta m$ said to be expres                 | some parts of Bengal,                |         |
| as a vegetable; an A A                                  | A A THE SALE TO DE EXPLES                                                 | scu nom the seeds in                 |         |
| <u> </u>                                                | <u> </u>                                                                  |                                      |         |
|                                                         |                                                                           |                                      |         |
| Fibre.—The most rec                                     | ent investigations on this                                                | subject are those of                 | FIRRE   |
| Fibre.— <u>The most rec</u><br>Dr. G. Watt, which, as t | <u>;ent investigations on this</u><br>he <u>y afford a complete résur</u> | subject are those of                 | FIRRE   |
| Fibre.—The most rec                                     | <u>;ent investigations on this</u><br>he <u>y afford a complete résur</u> | subject are those of                 | FIRRE   |

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| HIBISCUS<br>cannabinu <u>s.</u> | The Deccan Hemp. '                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FIBRE.                          | "This plant yields a soft, white, silky fibre, eminently suitable for<br>the coarser textile purposes to which jute is applied. It is largely<br>grown by the natives of India and employed for agricultural purposes-<br>ropes, strings, and sacks being made of it. Were, however, a demand to<br>be created for this fibre as distinct from that of Sunn-hemp or other fibres,<br>the cultivation of the plant might be indefinitely extended, and with<br>profit to many needy cultivators who are unable to produce either jute or<br>cotton. But so long as there exists the risk of a supply of the fibre being<br>ejected through a purchaser thinking he was ordering Sunn-hemp and<br>rhad this fibre thrust on him, a healthy trade in the fibre as an article of<br>export is never likely to be developed. It is, therefore, of the first import-<br>ance that <i>Ambdri</i> fibre should have its properties independently investi-<br>gated ; and that a place be established for it separate and distinct from<br>all the other fibres with which it has been confused in modern commerce,<br>or for which it has been employed only as an adulterant. Messrs. Cross,<br>Bevan, and King, in their table of the Chemical Analyses of Indian Fibres,<br>Jace Hibiscus cannabinus in their second list, which comprises such as<br>are of less textile value, because of lignification, as for example, Jute, Sid <sup>3</sup> .<br>Abroma, Pavonia, &c. Under Hydrolysis (i.e., boiling in one per cent,<br>caustic soda, Na <sub>2</sub> O) for five minutes, they show it to have lost H <sup>*&gt;</sup> And<br>after continued boiling for one hour, 19-5 of its weight, and that under<br>the same treatment, jute lost considerably less, viz. (a) 13 <sup>23</sup> , and (6) 18'0.<br>Further, that it contains 73-0 of cellulose, in other words, only 3 per cent,<br>caustic soda, Na <sub>2</sub> O) for five merit than any other single feature that can<br>be cited. The facts of hydrolysis and cellulose give, therefore, to this<br>fibre a considerably superior chain 60 recognition flaw most of the fibre. A<br>enumeraited above. It falls far short, however, of Sunn-hemp, a fibre tha<br>posesses 30 per cent, of ellulose, and of 313 |
|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Ambari | Fibre. |
|--------|--------|
|--------|--------|

HIBISCUS cannabinus\*

(J. Murray.)

Under jute in the same work it is stated that—'Slips of sized paper, FIBRE weighing 39 gr., made from this fibre, bore 60lb, as against Bank of England note pulp, 47ft.' And in another passage the measurements of jute filaments are given as max., 0\*196 in.; min., 0\*057 in.; mean 0\*078 in.; diameter : mean, o«oooS in. \* The shortness of the filaments explains their inability to withstand long exposure/ According tp the method of hydrolysis described in *Spons' Encyclopaedia*, the fibre of Hibiscus cannabinus is fully six times as durable as jute, whereas by Cross<sup>1</sup> method of hydrolysis it is slightly less durable than jute. Reducing the measurements given by Cross to inches so as to admit of comparison with those published in Spons\* Encyclopedia, the writer in the latter work gives the maximum as 0\*08 in. greater, and the minimum o-o? in. also greater than the measurements obtained by Cross. This ma: be due to some error in the instruments used by the two investigators. But should it be found that Hibiscus does actually possess longer filaments than jute, this fact should give to it a higher commercial position than it has as yet attained. It could be produced at the same price and be grown over a much wider area, hence some hopes of a greatly extended trade in Ambari fibre might be anticipated with the possession of a more thorough knowledge of its properties. In a Report recently issued by the A.gri-Horticultural Society of India, on some experiments performed with 'Hibiscus, Abutilon, Sansevieria, and Sida,' the Committee came to the conclusion that these fibres possess 'no advantages over that of jute.' But may it not be said that this conclusion was influenced by local necessities? It might not be of any special advantage to the jute-growers of Bengal to substitute for jute any of the fibres named; but from an imperial point of interest the question suggests itself whether it would not be advantageous for cultivators, in parts of India where jute cannot be grown, to adopt as a substitute or competitor either Hibiscus, Malachra, or Sida. It might, for example, be suggested that the effurts to cultivate jute in Madras could with advantage be abandoned in favour^pf Hibiscus cannabinus, and that the sacking trade of Bombay might, as once before suggested, be met by the organisation of a new industry in the fibre of Malachra capitata. Sida seems destined for a higher position than jute has as yet attained. "To turn now from chemico-microscopic examinations to the results of the practical tests performed by Dr. Roxburgh. Two specimens of this fibre were experimented on by the Father of Indian Botany, viz., (a) prepared from plants ' cut when in blossom and steeped immediately/ {b) 'the same cut when the seed was ripe.' Of (a) a line when dry broke with a weght of 1151b, when wet, of 1331b-the wet line gaining a tension represented by i8Ib; of (b) a dry line broke with nolb, a wet one with 1181b, gaining a tension of only 7lb by the process. According to these experiments the Ambari fibre deteriorates by the plants being allowed to grow beyond the flowering season. With Sunn-hemp (Crotalaria juncea), Abroma augusta, and several other fibres, the mature or stronger fibres are obtained when the plants are in fruit. Thus comparing with the above figures, a line of Sunn-hemp prepared from plants in flower broke when dry with 1301b, when wet with 185ft, cut while in fruit

the dry line broke with 160ft and the wet line with 209ft, the latter gaining 35ft in weight. Royle commenting on Roxburgh's experiments remarks :— 'So in Dr. Wight's experiments, the fibre of Hibiscus cannabinus, which is sometimes called the jute of Madras, broke with 290ft, when Sunn (Crotalaria juncea) broke with 404ft. Both these, like Dr. Roxburgh's specimens, were probably grown in the same climate. But in the author's experiments, Sunn broke with 150ft, when Brown-hemp broke with 190ft;

| HIBISCUS                                            | The Deccan Hemp, <sup>c</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| annabinu <mark>s.</mark>                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FIBRE-                                              | but the Sunn was from Bengal, and the Brown-hemp from Bombay. There<br>is, however, some uncertainty about this, because, though no fibres can yei'<br>appear more distinct than these two, yet the author has in his possession<br>fibres of a Crotalaria which are hardly to be distinguished from Hibiscus,<br>Brown-hemp, 'lhe Sunn fibre of Bombay was, even in Dr. Roxburgh,<br>time, remarkable for its dark colour. But some specimens <i>oi Arnoart</i><br>fibre, sent by Dr. Gibson as those of Hibiscus cannabinus, and which closely,<br>resemble those of some kinds of ordinary Brown-hemp, were favouraoiy<br>reported on by a Mr. Enderby, then of the rope-manufactory at Ureen-<br>wich. Brown-hemp is and has always been the peculiarly P <sup>r</sup> *P <sup>ared</sup><br>Sunn-hemp of Bombay, otherwise known as Salsette Hemp. Roxburgn<br>gave his own results of experiments with this, and admits that it is' A <sup>BNI</sup><br>tinctly superior to Bengal Sunn-hemp, is of a dark colour, and the fibres<br>more easily heckled because of being peeled off. Far from Royle's experi-<br>ments upsetting therefore the experiments of Roxburgh and of Wight, they<br>simply prove that Royle was comparing Bengal with Bombay Sunn-hemp,<br>and not, as he affirms, Bengal Sunn-hemp with Bombay Ambdri. Royle<br>may thus be viewed as having seriously laid the foundation of much of<br>the confusion in modern literature which has so materially retarded any<br>possible formation and growth both of a Sunn-hemp and an Antbdrt-noTe<br>industry.'' For Salsette or Brown Hemp the reader is referred to the<br>article on Crotalaria juncea, Vol. II., 595.<br>'' Dr. Buchanan-Hamilton wrote that the natives of Bhagulpur in nis<br>day considered this fibre stronger and more durable than jute. Mr. Hem<br>Chunder Kerr says that, «It is employed in Bengal for all the purposes<br>of jute and also for making fishing-nets and paper. <sup>5</sup> In a further para-<br>graph he gives an account of the process adopted in making paper from<br>this fibre with lime—20 seers of fibre to 3 of lime and 20 of water being<br>the proportions used.'' |
| TION.<br>Bengal.<br><b>179</b><br>NW.<br>Provinces. | O THE AMBARI-FIBRE PLANT.<br>"In Bengal.—Roxburgh, in his Flora Indica, says this plant is cultivated in the rainy season. Most writers affirm that it is grown as <sup>a mixed</sup> crop, only forming belts through or along the borders of <i>ddl</i> fields and other such crops. Dr. Buchanan-Hamilton alludes to having observed is cultivated in Bhagulpur nearly as extensively as jute. In Purneah h found it grown by itself and not as a mixed crop.<br>In the North-Western Provinces -Messrs. Duthie and Fuller admit that it is impossible to arrive at a definite knowledge regarding the extended of the sector.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 180                                                 | of cultivation, * but it is believed to be grown on a much smaller scale tha<br>Sanai. It is very rarely cultivated as a sole crop and most common<br>occurs as a border to fields of sugar-cane, cotton, and indigo. 'i<br>ordinary Doab Districts it is only met with as a sparse bordering to som<br><i>kharif</i> fields, and is merely grown for the domestic uses of the cultwaion<br>• Its cultivation will necessarily be similar to that of the crop with which<br>is associated, and thus it will be sown in February if as a border,<br>sugar-cane, in May if a border to <i>jomowa</i> indigo, and in July it a Dora<br>to cotton. 'When ripe the plants are cut down close to the ground or, a<br>pulled up by the roots. It is important that none of the lower part of the<br>submerged in water for a period varying from six to ten days according<br>the weather, when the bark can be easily pulled off by hand in long co<br>tinuous strips. The method of extraction is, therefore, much simpler mat<br>that of Sanai. If the stalks are kept too long in water, the fibre loses<br>greatly in strength, although gaining in colour.' The outstalling of the stalks are then is a<br><b>H. 180</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| Products of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 235                    |
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| Ambari Fibre. (7. Nutray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | HIBISCUS<br>annabinus. |
| between 125 seers and 20 seers an acre according to the thickness of the sowings and the degree to which the belts of fibre-plants are overshadow-<br>ed by the other crop. In the Azamgarh Settlement Report $\{p.u8\}_{g}$ it is stated of this plant that' it is grown throughout the district by culti-<br>vators of all castes round the edges of their sugar-cane fields. The seed is put into the ground at the beginning of the rains, and the plant is cut in October.'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TION.                  |
| <i>IK the Pan jab</i> —Stewart writes: 'It is generally raised in narrow<br>strips along the deegs of the fields of cotton or pulse, being sown either<br>about April and irrigated up to the rains, or sown during the latter, the<br>former giving much the best result ( <i>Edgewortk</i> ). Its fibre is used for the<br>manufacture of ropes, twine, and sacking. In Sind its fibre is considered<br>the best for nets and ropes, but it is rarely used for cloth.'<br>In the Kangra Settlement Report and also in the Montgomery Report<br>the plant is described as an autumn crop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 181                    |
| <i>In Bombay</i> —Lisboa says : <sup>a</sup> The fibres of this plant—which are pre-<br>pared by steeping the stems in water, are hard, and more remarkable for<br>strength than for fineness—might be considerably improved by care. A<br>line made of them, 4 feet long, sustained, when dry, a weight of 115ft; in<br>the wet state its tenacity was greatly increased, and it bore a strain of<br>I33tb. Is only adapted as a mixture for the commoner description of<br>paper.' The <i>Gazetteer of Bombay (Vol. XII., 153)</i> says the plant is sown<br>in June and reaped in October.''<br>In the Reports of the Director of Land Records and Agriculture,<br>Bombay, it is stated that the area under cultivation in that Presidency<br>was, in 1885-86, 53,488 acres, in 1886-87, 87,957 acres, and in 1887-89,                                                                                                                                                                                                                                                                                                            | 182                    |
| 71,588 acres.<br>In Madras—Roxburgh gives in his Coromandel Plants a full account<br>of this plant. He says: * The usual time of cultivation is the cold sea-<br>son, though it will thrive pretty well at all times of the year, if it has suffi-<br>cient moisture. A rich loose soil suits it best. The seeds aresown about<br>as thick as hemp, but generally mixed with some sort of small or dry<br>grain, rendering it necessary to be sown very thin, that the other crop<br>(which is one of those grains that does not grow nearly so high) may not<br>be too much shaded. It requires about three months from the time it is<br>sown, before it is fit to be pulled up for watering, which operation, with<br>the subsequent dressing, is similar to that hereafter described for Crotalaria<br>juncea.'<br>The most complete account of the cultivation of this plant which the<br>writer has had the pleasure of reading is that given by Mr. F. A. Nichol-<br>son in his Manual of the Coimbatore District (p. 238). He says :—'/'«/*<br><i>rnanji</i> is grown everywhere in gardens and on dry lands, but especially | 183                    |
| <i>rhangt</i> is grown everywhere in gardens and on dry lands, but especially<br>in red loams and gravels; in the former with various crops, such as tur-<br>meric, $ragi_y$ kambu, &c, in the latter with <i>cholam</i> and <i>kambn</i> . In gardens,<br>as a mixed crop, it is planted on the ridges of the beds and watercourses,<br>not indiscriminately; on dry land the seeds are mixed and sown broad-<br>cast. Occasionally it is grown as a separate crop in gardens, and is then<br>sown thickly about two or three inches apart in beds, and watered twice<br>a week.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| 'The fibre is prepared by bundling the stalks, which, after a few days, are steeped for nearly a week in water under stones; when sufficiently retted they are cleaned by beating them on the ground, the fibre stripped off, washed, and dried. Five hundred stems, about eight feet high, as grown <i>en masse</i> in gardens, were recently taken at random and the fibre removed and cleaned in the usual way; the result was 5Jib clean and good fibre. The stems when carefully dried weighed nearly 20ft.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |

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| HIBISCUS                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <u>collinus.</u>                                                                                                    | The Deccan Hemp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| CULTIVA-<br>TION.                                                                                                   | Assuming the acre to be 40,000 square feet, after allowing for waste patches, the number of stems at three inches apart would be $640,000$ ; hence the yield in clean fibre at lib per 100 would be $6,400lb=:2f$ tons; the stems would yield also 11 tons of poor fuel. The yield of three fine stems grown along the ridges in turmeric plantations, and measuring 16 to 17 feet hi>h, was 3} ounces of clean fibre, or somewhat over one ounce each, instead of £th of an ounce. The dried stems each weighed 5 ounces instead of less than $  hs $ of an ounce. The fibre is very well spoiten of; in some experiments it was stronger, in some weaker, than sunn-hemp. This fibre appears to offer a splendid field for agencies either for cordage, or more especially for paper stuff; it is grown with the greatest ease and abundance and on dry land it never fails, though less productive than when grown in gardens. At present, when produced only in small quantities and rudely extracted by hand, it is sold retail, including the rayat's profit, at Ri per 251b, and could certainly be produced far cheaper by the new machine. |
| Area.<br>184                                                                                                        | new machines. Any quantity could be grown to order.' "<br>"AREA OF CULTIVATION AND TRADE IN AMBARI HEMP.—No informa-<br>tion other than is conveyed by the above passages can be procured. It,<br>therefore, seems desirable that all future reports on the so-called hemp<br>fibres may deal with that of Hibiscus cannabinus separately from the<br>sunn-hemp and the true hemp."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| OIL.<br>Seeds.<br>185                                                                                               | Oil.—The SEEDS of this plant have been frequently sent from India to<br>England as an oil-seed. They are said, however, to yield only from 15<br>to 20 per cent., so in spite of their cheapness they are seldom crushed in<br>this country. The oil is clear and limpid and, though coarse, forms a good                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MEDICINE.<br>Juice.<br>186<br>Seeds.<br>187<br>Leaves.<br>188<br>FOOD.<br>Leaves.<br>189<br>S <b>rots</b> .<br>Oil. | lubricating and illuminating material.<br>Medicine. —The JUICE of the flowers mixed with sugar and black pepper<br>is a popular remedy for biliousness ( <i>Pharmacog. Ind.</i> ). The SEEDS are<br>said by Persian writers to be aphrodisiac and fattening, the latter quality<br>being probabl> due to the edible oil they contain. They are also employed<br>externally is a poultice for pains and bruises. The LEAVES are aperient.<br>SPECIAL OPINION.—§ "The leaves are used as a pot-herb by those<br>suffering from constipation, and I am fully aware of its laxative proper-<br>ties." ( <i>Honorary Surgeon Enston Alfred Morris, Tranquebar.</i> )<br>Food and Fodder.—The YOUNG LEAVES are employed as a pot-herb,<br>and the SEEDS, which yield an edible OIL, are eaten when roasted, and in<br>the Poona District are also used as cattle food.<br>Domestic—It is reported that, in the Meerut District, the dried STALKS<br>are used in making matches, being split into small pieces and tipped with                                                                                                                             |
| <b>291</b><br>DOMESTIC.                                                                                             | some preparation of sulphur.<br>Trade.—See final paragraph of description of the fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Stalks.<br>192                                                                                                      | Hibiscus collinus, Roxb., FL Br. Ind., /., 33S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| trade.<br><b>193</b>                                                                                                | Syn.—HIBISCUS ^ESTUANS, <i>Wall;</i> H. ASPERATUS, <i>Wall.;</i> H. ACERIFOLIUS,<br>H. ERIOCARPUS, DC. ; H. SIMPLEX, Roxb. ; PAVONIA ACERIFOLIA, Lk. &                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 193<br>194                                                                                                          | <ul> <li>Otto.</li> <li>Vern.—Konda-gang (Roxb.), ? konda benda (Elliot), TEL.</li> <li>References.—£0*6., Fl. Ind., Ed. C.B.C., 525; Tkwaiies, En. Ceylon PL, 26; W. &amp; A., PL Prodr., /., sr; Trimen, Syst. Cat. Cey. PL, n; Royle, Fib. PL, 261.</li> <li>Habitat.—An arboreous plant of the Western Peninsula, found in the</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FIBRE.<br>Bark.<br>195                                                                                              | Konkan, Circars, and Coromandel, also in Ceylon.<br>Fibre.—Roxburgh writes : "The natives of the Circars use the BARK as<br>a substitute for hemp ; " and in another passage, "The mountaineers use<br>the bark of this species for cordage. I have often observed that the bark<br>of most of the Indian plants of this class, particularly of this family, might                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                     | Н. 195                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| <ul> <li>area inder cultivation is 1<sup>425</sup> acres. The seed is sown in the mont June and the fruit gathered in October. The cost of cultivation for 1 is R2 and the produce sells for R5. The seed is sown in soft soil by ging a hole of 4 inches depth. The annual production is calcul at 20,000 fruits, and the cost per 100, if purchased locally, is F IN THE HANTHAWADDY DISTRICT the area of cultivation is abo acres. It is generally sown in the months of December and January, the fruit collected a month or so after. In the rains it is also s about the month of June, and the fruit collected about the same afterwards. The cost of its cultivation per acre is about R5-2 and profit about R7. The soil best adapted for its cultivation is one of a nature. Furrows are made in it and the seeds are sown in row-fruit is generally used for culinary purposes.<sup>1</sup></li> <li>N.W. Forvinces.</li> <li>N.W. Provinces.</li> <li>200</li> <li>Punjab. 201</li> <li>Punjab. 201</li> <li>Punjab. 202</li> <li>Punjab. 202</li> <li>Yune the babit of the behead plate the fruit is also of the principal vegetables, grown all over the district. In Bombay, —The Acting Director of Land Records and Agricul Poona, writes: — Though it is grown in graden lands at other times of its ruit the vegetables, grown all over the district. In Bombay, —The Acting Director of Land Records and Agricul Poona, writes: — Though it is grown in graden lands at other times of our sub-divided into "early" and "late" bhendi. The early variety is sin June and bears from early August to December. The plant gradout 2 feet high, the leaves are large, and the pod short and the the law variety is sown in June or July along the edges of, or am bajri crops. It begins to bear late in September and continues till the of November. The plant racches 6 to 7 feet in height. The leaves are large in ads sub-divided into "early from an in the collector of Bellaxy grow from a stake. The Acting Director of Land Records and Agricul Poona, writes is obta at ne panns area. The seed s grow within a we</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | HIBISCUS<br>esculentus. | The Edible Hibiscus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <ul> <li>It is reported also to be more or less extensively cultivated under s lar conditions in the districts of Sandoway, Kyaukpyu, Mandalay, Th waddy, Thongwa, Bassein, Shwegyin, Amherst, Ruby Mines, Tou Bhamu, and in the Eastern Division of Upper Burma. In all these tricts it seems to be cultivated entirely for local demand, as the fruit is important article of diet with all classes of Burmans.</li> <li>NW.</li> <li>Provinces.</li> <li>200</li> <li>Punjab.</li> <li>201</li> <li>Bombay.</li> <li>202</li> <li>202</li> <li>202</li> <li>203</li> <li>204</li> <li>205</li> <li>205</li> <li>205</li> <li>206</li> <li>Punjab.</li> <li>206</li> <li>Punjab.</li> <li>207</li> <li>207</li> <li>208</li> <li>209</li> <li>209</li> <li>Punjab.</li> <li>201</li> <li>Bombay.</li> <li>202</li> <li>201</li> <li>201</li> <li>Bombay.</li> <li>202</li> <li>202</li> <li>202</li> <li>203</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>206</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>202</li> <li>202</li> <li>203</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>202</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>205</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>202</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>205</li> <li>204</li> <li>206</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>201</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>204</li> <li>204</li> <li>204</li> <li< td=""><td></td><td>for exportation, the fruit being eaten locally. In the PROME DISTRICT the<br/>area under cultivation is 1*25 acres. The seed is sown in the month of<br/>June and the fruit gathered in October. The cost of cultivation for   acr<br/>is R2 and the produce sells for R5. The seed is sown in soft soil by dig<br/>ging a hole of 4 inches depth. The annual production is calculated<br/>at 20,000 fruits, and the cost per 100, if purchased locally, is R1-4<br/>IN THE HANTHAWADDY DISTRICT the area of cultivation is. about a<br/>acres. It is generally sown in the months of December and January, and<br/>the fruit collected a month or so after. In the rains it is also sown<br/>about the month of June, and the fruit collected about the same tim<br/>afterwards. The cost of its cultivation per acre is about R5-2 and th<br/>profit about R7. The soil best adapted for its cultivation is one of a ligh<br/>nature. Furrows are made in it and the seeds are sown in row~. Th<br/>fruit is generally used for culinary purposes/'</td></li<></ul> |                         | for exportation, the fruit being eaten locally. In the PROME DISTRICT the<br>area under cultivation is 1*25 acres. The seed is sown in the month of<br>June and the fruit gathered in October. The cost of cultivation for   acr<br>is R2 and the produce sells for R5. The seed is sown in soft soil by dig<br>ging a hole of 4 inches depth. The annual production is calculated<br>at 20,000 fruits, and the cost per 100, if purchased locally, is R1-4<br>IN THE HANTHAWADDY DISTRICT the area of cultivation is. about a<br>acres. It is generally sown in the months of December and January, and<br>the fruit collected a month or so after. In the rains it is also sown<br>about the month of June, and the fruit collected about the same tim<br>afterwards. The cost of its cultivation per acre is about R5-2 and th<br>profit about R7. The soil best adapted for its cultivation is one of a ligh<br>nature. Furrows are made in it and the seeds are sown in row~. Th<br>fruit is generally used for culinary purposes/' |
| <ul> <li>200 Punjab. 201 Bombay. 202 202 202 202 202 202 202 202 202 20</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         | It is reported also to be more or less extensively cultivated under similar conditions in the districts of Sandoway, Kyaukpyu, Mandalay, Thara waddy, Thongwa, Bassein, Shwegyin, Amherst, Ruby Mines, Toungu Bhamu, and in the Eastern Division of Upper Burma. In all these districts it seems to be cultivated entirely for local demand, as the fruit is a important article of diet with all classes of Burmans.<br>In the North-West Provinces? Atkinson writes: "Cultivated in gam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <ul> <li>201 Bombay. 202 it as one of the principal vegetables, grown all over the district. <i>In Bombay.</i>—The Acting Director of Land Records and Agricult Poona, writes:—" Though it is grown in garden lands at other times of year, the habit of the <i>bhendi</i> plant is adapted to the rains. From form of its fruit the vegetable is divided into two kinds, one bearing ribbed fouits, and the other eight-ribbed. Besides this main division, sub-divided into "early" and "late" <i>bhendi</i>. The early variety is s in June and bears from early August to December. The plant g about 2 feet high, the leaves are large, and the pods short and th The late variety is sown in June or July along the edges of, or am <i>bajri</i> crops. It begins to bear late in September and continues till the of November. The plant reaches 6 to 7 feet in height. The lea small and the pod thinner than in the other variety, and prickly. acre rate of seed varies from 5 to iolb. It is sown on ridges 3 feet af Two or three seeds are put in holes one foot apart. The seed spr within a week. When the seedlings are a span high, they are man with fish manure, farm yard manure or ashes, with a view to favour growth; the plants are topped when a cubit high. Insufficiency of wat the plants are flowering causes an insect pest which is destroyed sprinkling ashes over the plants. The acre yield varies from 0,00 6,500a." <i>In Madras.</i>—The Collector of Cuddapah writes :—<sup>w</sup> The area under crop is not available. It is sown in July, and the plants survive for a y The soil requires to be richly manured. Cost of cultivation is per cawny, and profit R40. No fibre is taken from the stem. The ripe fruit is sold at one anna a túk." The Collector of Bellary gives following information : "The area of cultivation is giver only in a taluks where it is estimated at 73 acres. There are two crops in the y one, sown from 3rd to 15th March and gathered from 3rd to 15th and ther sown from 15th to 30th July, and gathered in the see <b>Pafit</b> N<sup>D</sup>?D mber, The cost of cultivation is about R5 per acr</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         | In the Panjab.—Stewart mentions it as grown by natives and Euro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul> <li>Bombay.</li> <li>202</li> <li>In Bombay.—The Acting Director of Land Records and Agricult Poona, writes:—" Though it is grown in garden lands at other times of year, the habit of the bhendi plant is adapted to the rains. From form of its fruit the vegetable is divided into two kinds, one bearing ribbed f&gt;uits, and the other eight-ribbed. Besides this main division, sub-divided into "early" and "late" bhendi. The early variety is s in June and bears from early August to December. The plant gr about 2 feet high, the leaves are large, and the pods short and the the variety is sown in June or July along the edges of, or am bajri crops. It begins to bear late in September and continues till the of November. The plant reaches 6 to 7 feet in height. The lea small and the pod thinner than in the other variety, and prickly. acre rate of seed varies from 5 to iolb. It is sown on ridges 3 feet af Two or three seeds are put in holes one foot apart. The seed spr within a week. When the seedlings are a span high, they are manw with fish manure, farm yard manure or ashes, with a view to favour growth; the plants are topped when a cubit high. Insufficiency of wate the plants are flowering causes an insect pest which is destroyed sprinkling ashes over the plants. The acre yield varies from 0,00 6,500a."</li> <li>Madras.</li> <li>203</li> <li>Madras.</li> <li>Madras.</li> <li>Madras.</li> <li>Por caway, and profit R40. No fibre is taken from the stem. The ripe fruit is sold at one anna a túk." The Collector of Bellary gives following information: "The area of cultivation is givear only in taluks where it is estimated at 73 acres. There are two crops in the y one sown from 3rd to 15th March and gathered from 3rd to 15th Jan be other sown from 15th to 30th July, and gathered in the see White K D?D mber, The cost of cultivation is about R5 per acre.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul> <li>Madras.</li> <li>203</li> <li>203</li> <li>203</li> <li>2</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Bombay.                 | In Bombay.—The Acting Director of Land Records and Agriculture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <ul> <li>Madras.</li> <li>203</li> <li>Madras.</li> <li>203</li> <li>Madras.</li> <li>203</li> <li>Madras.</li> <li>203</li> <li>Madras.</li> <li>203</li> <li>Amadras.</li> <li>204</li> <li>Amadras.</li> <li>205</li> <li>Amadras.</li> <li>206</li> <li>Amadras.</li> <li>207</li> <li>Amadras.</li> <li>208</li> <li>Amadras.</li> <li>209</li> <li>Amadras.</li> <li>209</li> <li>Amadras.</li> <li>203</li> <li>Amadras.</li> <li>203</li> <li>Amadras.</li> <li>203</li> <li>Amadras.</li> <li>204</li> <li>Amadras.</li> <li>205</li> <li>Amadras.</li> <li>205</li> <li>Amadras.</li> <li>206</li> <li>Amadras.</li> <li>207</li> <li>Amadras.</li> <li>208</li> <li>Amadras.</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>209<td>202</td><td></td></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 202                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul> <li>Madras.</li> <li>203</li> <li></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                       | form of its fruit the vegetable is divided into two kinds, one bearing six<br>ribbed f>uits, and the other eight-ribbed. Besides this main division, it i<br>sub-divided into "early" and "late" <i>bhendi</i> . The early variety is sown<br>in June and bears from early August to December. The plant grow<br>about 2 feet high, the leaves are large, and the pods short and thick<br>The late variety is sown in June or July along the edges of, or among<br><i>bajri</i> crops. It begins to bear late in September and continues till the end<br>of November. The plant reaches 6 to 7 feet in height. The leaf i<br>small and the pod thinner than in the other variety, and prickly. The                                                                                                                                                                                                                                                                                                                                       |
| 203 crop is not available. It is sown in July, and the plants survive for a y<br>The soil requires to be richly manured. Cost of cultivation is<br><b>per cawny</b> , and profit R40. No fibre is taken from the stem. The<br><b>ripe fruit</b> is sold at one anna a túk." The Collector of Bellary gives<br>following information: "The area of cultivation is given only in<br>taluks where it is estimated at 73 acres. There are two crops in the y<br>one sown from 3rd to 15th March and gathered from 3rd to 15th J<br>ana the other sown from 15th to 30th July, and gathered in the sec<br><b>par</b> it <sup>ot</sup> k D?D mber, The cost of cultivation is about R5 per acre-and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                         | Two or three seeds are put in holes one foot apart. The seed sprout<br>within a week. When the seedlings are a span high, they are manured<br>with fish manure, farm yard manure or ashes, with a view to favour sid<br>growth; the plants are topped when a cubit high. Insufficiency of water a<br>the plants are flowering causes an insect pest which is destroyed by<br>sprinkling ashes over the plants. The acre yield varies from 0,000 to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| H. 203                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         | ripe fruit is sold at one anna a túk." The Collector of Bellary gives the<br>following information: "The area of cultivation is given only in two<br>taluks where it is estimated at 73 acres. There are two crops in the year<br>one sown from 3rd to 15th March and gathered from 3rd to 15th July<br>and the other sown from 15th to 30th July, and gathered in the second<br>"Afitotk D?D mber, The cost of cultivation is about R5 per acre-and the<br>pront about K9. This is generally a mixed crop grown along with cereals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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| but in some places as Hadagali and Harpanapally it is grown as a garden<br>crop. Red and black soils are both adapted for its growth. After ploughing,<br>the land should be divided into beds wherein the seeds are sown and watered<br>twice a week. It is eaten as a vegetable." In still another report, from<br>the Madura District, it is stated that "The <i>vendai</i> is grown in backyards<br>and gardens. The extent of cultivation is about 150 acres. Sowing begins<br>in July said continues almost throughout the year, and the plant begins to<br>yield in October. There are two varieties of this plant known in this dis-<br>trict, one of which is taller than the other. The former is said to live for<br>about six or seven months, the latter a month or two less. One acre is said<br>to produce about 60 basketfuls of fruits, costing about R15, while the expense<br>of cultivation is estimated at Rio. Seeds of 100 fruits will sow one acre.<br>Three {>loughings are made to prepare the land ; then the soil is manured<br>and ploughed again. Plots are formed and the seeds buried one by one<br>at a distance of 3 or 4 feet. Weeding is required after one month, and<br>the plots are watered once every two or three days."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |
| Dye.—Roxburgh mentions that the STIGMAS are replete with a very<br>beautiful deep purple juice which they communicate to paper, and which is<br>tolerably durable. Murray, in his <i>Plants and Drugs ofSind</i> , confirms this,<br>and adds that the stained paper forms a substitute for litmus paper. The<br>writer can find no further record of the employment of this colouring<br>matter as a dye.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Stigmas. 204                             |
| Fibre.—The bast yields a strong useful fibre of a white colour, which is<br>long and silky, generally strong and pliant, and composed of very fine in-<br>dividual fibres. It is employed economically in some parts of India, but in<br>many districts where the plant is much grown as a vegetable the excellenco<br>of the fibre seems to be unrecognised. It is undoubtedly valuable and seems<br>to possess qualities specially fitting it for the purposes of paper-making.<br>According to Roxburgh its breaking strain is 79A when dry, 95ft vjien wet.<br>It contains 74 per cent, of cellulose, and in Messrs. Cross, Bevan, and King's<br>experiments it was found to lose 9*8 and 14*2 per cent, of its weight, when<br>boiled in 1 per cent, solution of caustic soda for five minutes and one hour<br>respectively. The AgriHorticultural Society of India, in the experiments<br>referred to under H. Abelmoschus, found H. esculentus to yield a poor crop,<br>sparse in low lying places. The average acre yield of fibre by Death and<br>Ellwood's process was only 84 Jib, while by retting, even from this poor<br>crop, it amounted to 6 maunds and 17 ssers. Liotard, in his <i>Paper-mak-<br/>ing Materials of hidia</i> , notices the fibre, mentioning that it is very fine and<br>well suited for paper-making, and in another passage says that paper has<br>been made with it, though only on a small scale, in the Lucknow Central<br>Jail. In France, the manufacture of paper from this fibre is the subject of<br>a patent; it receives only mechanical treatment, and affords a paper called<br><i>banda</i> , equal to that obtained from pure rags. In Burma, Madras, and<br>other parts of India, the stem is allowed to rot unused. This valuable<br>fibre, which could thus be obtained very cheaply, does not appear to have<br>attracted the attention that it merits. | 205                                      |
| Medicine.—The mucilage from the FRUIT and SEEDS is used medicinally<br>as a demulcent in gonorrhoea and irritation of the genito-urinary system.<br>Muhammadan writers describe it as cold and moist and beneficial to<br>people of a hot temperament. Roxburgh considers the fruit nourishing as<br>well as mucilaginous, and views it as one of the best of esculent herbs in India.<br>The WHOLE PLANT, but particularly the CAPSULES, is replete with much<br>mild mucilage, and might with advantage be applied to all diseases requir-<br>ing emollients and demulcents Roxburgh strongly recommends its use<br>in irritating cough. Waring, in his <i>Bazar Medicines</i> , calls this plant Abel-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 206<br>Seeds*<br>207<br>Capsules.<br>208 |

| HIBISCUS<br>ficulneus.                     | Another Hibiscus Fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            | moschus and recommends a surun composed of Abrus root. Abelmoschus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Root.<br>209                               | moschus, and recommends a syrup composed of Abrus root, Abelmoschus<br>and sugar.<br>The fresh immature capsules have a place amongst the officinal drugs<br>of the Indian Pharmacopoeia, in which the fruit is described as a valuable<br>emollient and demulcent, and as diuretic. It is there recommended as a<br>drug which " may be resorted to with confidence in catarrhal affections<br>ardor urinae, dysuria, gonorrhoea, and other ca^es requiring demulcent and<br>emollient remedies." O'Shaugnessy's <i>Bengal Dispens dory</i> contains a pre-<br>scription for a Hibiscus lozenge which is recommended as highly soothing<br>in irritable conditions of the pharynx. Both the fruits and leaves are also<br>employed externally as an emollient poultice. The U. S. Dispensatory<br>contains the following information regarding the ROOTS : "They are said<br>also to abound in mucilage, of which they yield twice as mucn as the<br>Althaea root from the same weight, free from any unpleasant odour. Their<br>powder is perfectly white, and superior also to that of marsh mallow."<br>SPECIAL OPINIONS.—§ " Is sometimes used for dysentery " (Surgeon'<br>Major C. 7. McKenna, I.M.D., Cawnpore). *'Used as a laxative and<br>diuretic in dropsical affections'' (Surgeon-Major J. J. L. Ratton, M.D.,<br>Salem). "The mucilage is used in Mysore for gonorrhoea, and it is also<br>said to be aphrodisiac'' (Surgeon-Major y. North, Bangalore). "This<br>vegetable may be allowed where others are inadmissible in bowel com-<br>plaints, owing to its demulcent properties" (Assistant Surgeon Shib<br>Chundra Bhattacharji, Chanda, Central Provinces). "Demulcent, diure-<br>tic, doses Jii to 51V, used in catarrhal attacks, irritability of the bladder.<br>kidney, and gonorrhoea" (Chuna Lall, Ist Class Hospital Assistant, Jub-<br>bu/pore). "The fruit is useful in gonorrhoea and dysentery. The bark<br>of the stem is made into ropes, the stems being treated in the same<br>manner as hemp. The young pods are eaten by the natives when suffer-<br>ing from spermatorrhoea" (Narain Misser, Hospital Assistant, Hoshna- |
| ļ                                          | abady -Central Provinces),                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| FOOD.<br>Fruit.                            | <b>Food.</b> —The unripe FRUIT is a favourite vegetable both with Natives and Europeans in India, and is also eaten in the south of France and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>210</b>                                 | Levant. In European cookery its mucilaginous property is taken advant-<br>age of in the thickening of soups, &c. The more mature fruit is employed<br>by the natives as a constituent of curry, and when quite young forms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Seeds.<br>211<br>FODDER.<br>Leaves,<br>212 | a good pickle. The SBRDS are said to be used as a substitute for pearl<br>barley, and to flavour coffee, and are also eaten on toasted bread.<br>Fodder.—The LEAVES are used in parts of Madras as cattle fodder.<br>Domestic Uses.—The dried stalks are reported to be used by the poor<br>as fuel in the Beltory District of Madras.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| DOMESTIC.                                  | Trade.—As already stated, there is no direct export of the FIBRE from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 213<br>TRADE.<br>214                       | India, nor is it sold at all, except either as an adulterant of jute, or under<br>the name of hemp. In Dacca and Mymensmgh it is said to be exported<br>under the latter appellation to the extent of a few thousand cwt. yearly. The<br>price of the fruit varies in different parts of the country, and according to<br>the demand for it. Thus in Bellary it is reported to vary from 2 to 3 annas<br>a maund, in Cuddapah from 2 to 3 seers for quarter of an anna, in P.egu<br>the price of from 8 to 10 fruits is 1 anna, and in the Ruby Mines it is sold<br>at 4 annas a viss.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 215                                        | Hibiscus ficulneus, Linn.; Fl Br <sub>m</sub> Ind., I., 340; Wight, Ic, /. 15+<br><sup>Sy</sup> ?'T <sup>H</sup> * <sup>STRICT</sup> ^s. Roxb., Hort. Beng., 52; H. PROSTRATUS, Roxb., Fl.<br>Ind., ABELMOSCHUS FICULNEUS, W. & A., Prod., /., 53-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                            | <ul> <li>Vern —Ban-dhenras or dheras, BENG.; Kapasiya, NW. P. i Dula, PB.;</li> <li>Parupy benda, nella-benda, TAM.<br/><sup>A</sup>t<sup>2a</sup>r (KoxA) FL ind &gt; E*' C B C S27 and 528; V<ngi, horl<br="">sub. Cal.<sub>tr T9</sub>. Thwaites, En. Ceylon PL, 27; Stewart, Punjab Plants, 21</ngi,></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                            | <b>H.</b> 215                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| • iU ,,,, ,_ ,, , HI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BISCUS                   |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>phylluS.</u>          |
| <ul> <li>Atkinson, Him. Dist., 7W i Royle, Fib. PL, 260; Cross, Sevan, and King, Report on Indian Fibres, 40; Watt, Hibiscus in Selections from the Rec. ofGovt. of Ind., Rev. and Agri. Dept., 1,272 / Balfour, Cyclop. Jnd., II., 44; Journ. AgriHort. Soc, New Series, VII., 224,229; Indian Forester, XII., app. 7; Gazetteer, NW. P., IV., Ixviii.</li> <li>Habitat.—Indigenous in the hotter parts of India from the Pan jab, North-West Provinces, and Bengal to Madras. A small, herbaceous, annual bush, which should be sown at the beginning of the rains. Roxburgh recommends a little earlier date for sowing, namely, in May, the plants being transplanted (from the seed-bed) in rows nine inches apart when about six inches high.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          |
| Fibre.—Dr. G. Watt, in his exhaustive account of Hibiscus, writes :<br>"Like most other MALVACEAE this plant yields a valuable fibre. Roxburgh<br>says : '^n none have I found so large a quantity, equally beautiful, long,<br>glossy, white, fine and strong as in this. To these properties may be added<br>the luxuriant growth and habit of the plant, rendering it an object of<br>every care and attention, at least until the real worth of the material is<br>fairly ascertained.' Like many of Roxburgh's valuable economic discover-<br>ies, this has remained for nearly a century without a single fact having<br>been added, or any progress made towards utilising the tons upon tons of<br>valuable fibre lying useless on our waysides. Roxburgh planted 40<br>square yards in the manner above described, and obtained 'thirty-three<br>pounds weight of the naturally very clean fibres.' In his experiments<br>with this fibre he found that a dry line of it broke with a weight of ro4lb,<br>and a wet line with 115ft, <sup>three</sup> fibre having gained I2lb in weight by being<br><b>wetted</b> . <b>1 1 1 1 1 1 1</b><br>"This was one of the fibres recently experimented with by the Agri-<br>Horticultural Society ; and by the Death and Ell wood Machine, they ob-<br>/ tained from 20 seers of green stems 2*81 per cent, of clean fibre and <b>1*41</b><br>waste fibre. Commenting on this experiment they say: * Even the <i>haw</i><br><i>dhenras</i> , with its large amount of mucilage, was worked out with the<br>^reatest ease' Mr. Atkinson, in his <i>Himalayan Districts</i> , says of this<br>plant that it 'affords a very large proportion of strong fibre of a white<br>colour, useful for twine and light cordage.'''<br>Oil.—Lieutenant Hawkes mentions this plant as yielding one of the | FIBRE.<br>216            |
| oils of South India.<br><b>Food.</b> —The SEEDS are often put in sweetmeats, and are employed in:<br>Arabia for giving perfume to coffee.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ECOD.<br>FOOD.<br>Seeds. |
| Hibiscus furcatus, Roxb. > Fl. Br. Ind., /., jjs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 218                      |
| <ul> <li>Syn. — ? HIBISCUS HISPIDISSIMUS, Griff.; H. ACULEATUS, Roxb.; H. BI-KURCATUS, Roxb. ic. ined., not of Willd. nor of Hort. Beng.</li> <li>Vern.—Konda gongura, TEL.; Hin ndpiritta, SING.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 527; Thwaites, En. Ceylon PL&gt;26; Dale. &amp; Gibs., Bomb. Fl., 19; Elliot, Fl. Andhr., 95; Murray, Pl-and Drugs, Sind, 62; Atkinson, Him. Dist., 306; Lisboa, U. PL Bomb.* 33s; Rayle, Fib. PI., 261, 268; Spons, Encyclop., 962; Bomb. Gazetteer*XV., 71.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 219                      |
| Habitat.—A prickly-stemmed shrubby plant, found in the hotter parts<br>of India from Bengal to Ceylon.<br>Fibre.—Like most other species of this genus, this plant yields, from<br>its bast, abundance of strong, white, flaxen fibres, which Roxburgh found<br>to have a breaking strain of 89ft when dry and 92ft when wet. Owing,<br>however, to the strong sharp spines with which the stem is covered, it is<br>not so easily manipulated as other species of Hibiscus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FIBRE.<br>220            |
| H. macrophyllus, Roxb.; Fl. Br. Ind., /., 331.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 221                      |
| Syn.—H. SETOSUS, <i>Roxb.;</i> H. VESTITUS, <i>Griff.</i><br>16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | [                        |
| H. 221                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |

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| HIBISCU                  | JS The Shoe-Flower.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| rosa-siner               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                          | <ul> <li>Vern.—Kachia udal,kasaya palla,hENQ.} Yet woon (Kurz), Bet-tn*&gt;*<sup>m</sup></li> <li>shau (Mason), BURM.</li> <li>References.—/?^*., FL Ind., Ed. C.B.C., 5*3; Kura, For. Fl. Burm.,T*</li> <li>127; Mason, Burma and Its People, 520, 756; Indian Forester, XI ¥&gt;&gt;</li> <li>269.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| FIBRE.                   | Habitat.—A tree or shrub of Eastern Bengal and the Eastern Peninsula, from Sylhet and Chittagong to Mergui and Penang.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Bark,<br>222             | Fibre.—The BARK yields a strong cordage fibre, valued ty the Bur-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| TIMBER.                  | mans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 223                      | Structure of the Wood.—Rather heavy, fibrous but close-grained, soft, white, turning pale-brown on exposure. Kurz expresses the opinion that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                          | it might be used for house-posts, and for other in-door house-building                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 224                      | purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                          | Hibiscus mutabilis,Z./ FL Br. Ind., /., 344.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                          | THE CHANGEABLE HIBISCUS.<br>Syn.— H. iESTUANS, <i>Rottler in Herb</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                          | <b>Vern.</b> —Shalapara, sthalkamal, HIND.; Thulpadma, sthalpadma, BENG.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                          | <ul> <li>Gul~i-ajaib, PB.; Padma-chdrini, sthalapadma, SANS.</li> <li>References.—Roxb., Fl. fnd., Ed. C.B.C., 525; Stewart, Pb. PL, 22; Aitchison, Cat. Pb. and Sind PL, 21; Rheede, Hort. MaL<sub>t</sub> VI., 38—42; U. C. Dutt, Mat. Med. Hind., 3i2, 3ig; Lisboa, U. PL Bomb., 227; Atkinson, Ec. Prod., NW. P., Pt. V., 14; Royle, Fib. PL, 261,269/ Journ. Agri.'Hort. Soc<sub>9</sub> VII. (New series), 224, 226, 227.</li> <li>Habitat.—A small tree without prickles, which has flowers that change</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| FIBRE.<br>Bark.<br>. 225 | in colour, almost white in the morning and red at night. It is a native of<br>China, but is now largely cultivated in gardens all over India from the<br>Panjab to Burma and Madras.<br>Fibre.—As with most of the members of the genus, the BARK yields a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| FOOD.                    | strong fibre, of which that from the inner layer is soft and silky, that from<br>the outer layer hard and of a lead colour. Roxburgh found it inferior<br>for cordage purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 226<br>227               | <b>Food.</b> —Atkinson <i>Economic Products af the North*West Provinces</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 221                      | mentions H. mutabilis as being " cultivated for pickling."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                          | H. rosavsinensis t. Josim, Himps; Timpa, Joba Jiwa, oru, DBRG.,<br>hudhal, Jasu, Jasu, DEC.; Jasavanda, BOMB.; Josavanda, dasinda-<br>the Shoe t. Ower. Eng. KEGMIADD. COCHTANCHDANA push-<br>cha-phuta, NIAK.; Jasuva, iu, IS KEGMIADD. Cochtana chimpa-<br>panui, japdpushpamu, das ana , TEL.; Dasavala; oung-yan, Bukana;<br>rattip-puva, ayamparatti, MALAY.; Kaung-yan, k., Angara-hindi,<br>Jobajapa-pushpam, SANS.; Anghara-hindi, ARA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                          | PERS. For. Fl. Burm.,<br>References.—Roxb., Fl. Ind., Ed. C.B.C., 523; Kur*, Ind., II., 359 ;<br>I., 126 ; Elliot, FL Andhr., 6> 73; <sup>NI</sup> /> **"* Med. Hind., 300 ;<br>aShaughnessy, Beng. Dispens., 218 ; U.C. Dutt, Mat. ASind, 63 ; Bidie,<br>x. Arjunt, Bamoa Fresh, and Fresh, Produd Diskeriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Cat. Raw Pr., Paris Exh., No. 135 ; Moodten Sheriff, Mat. Med. of<br>Gat. Signation Sheriff, Mat. Med. of<br>NW. P., Pt. V., 14 ; McCann, Dyes and Tans, Beng., 66 ; Piesse,<br>of NW. P., Pt. V., 14 ; McCann, Dyes and Tans, Beng., 66 ; Piesse,<br>of Bot., I., 589 ; Journ. Agri. Hort. Soc., VII., (New series), 224,<br>of Bot., J., 589 ; Journ. Agri. Hort. Soc., VII., (New series), 224,<br>of Bot., J., 589 ; Journ. Agri. Hort. Soc., I., 57 ; Orissa, II., 179 ; N<br>226, 227 ; Gasetteers - Mysore and Coorg, I., 57 ; Orissa, II., 179 ; N |
|                          | W. P., I., 79 riiitia but found<br>Habitat—A favourite ornamental bush, a native of $otilin \land erous$ varie-<br>in most flower gardens in the plains of India. There are $onument \circ ver$ seeds<br>ties, single and double, red, yellow, and white. The plant $n^*$<br>in India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                          | <b>H.</b> 227                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| Dye.—Dr. Bidie reports that an infusion of the FLOWERS produces a purplish hue. Dr. McCann, in his <i>Report on the Dye-stuffs of Bengal</i> , writes that, "It is mentioned from Hugli that a red dye is obtained by children from the flower which is used in colouring paper. If the flowers are rubbed on paper they give at first a reddish colour, turning immediately into a pretty purple or lilac; the addition of a little acid turns this at once into a bright red." Roxburgh states that the petals are used to blacken shoes, hence the English name of the plant. The Chinese are said to utilise them in the same way, and also to make a black dye for their hair and eyebrows from the petals.                                                                                                                                                                                                                       | DYE.<br>Flowers.<br>228                                                  |
| Fibre—The BARK yields a good fibre.<br>Medicine.—The FLOWERS are considered emollient, and an infusion of<br>the petals is given as a demulcent. Moodeen Sheriff reports favourably<br>of an infusion or syrup of the petals as a demulcent and refrigerant drink<br>in fevers, and as a demulcent in cases of ardor urinae, strangury, and irrit-<br>able conditions of the genitourinary tract. He also recommends an oil,<br>made by mixing the juice of the fresh petals and olive oil in equal portions,<br>and boiling till all water has evaporated, as a stimulating application for<br>the hair. O'Shaughnessy considered the LEAVES to be emollient, anodyne,<br>and laxative. Murray { <i>Plants and Drugs of Sind</i> }, and Taylor ( <i>Medical<br/>Topography of Dacca</i> ), both mention the employment of the flower by the<br>Natives in the treatment of menorrhagia, the former describing it as ad-               | FIBRE.<br>Bark.<br>229<br>MEDICINE.<br>Flowers.<br>230<br>Leaves.<br>231 |
| ministered fried in <i><rhi< i="">.<br/>SPECIAL OPINIONS.—§" The red variety is useful in colouring syrups "<br/>(Honorary Surgeon P. Kinsley, Chicacole, Ganjam, Madras). "SEEDS<br/>pounded into a pulp, and mixed with water, are given in gonorrhoea"<br/>[Surgeon Anund Chunder Mukherji, Noakhally, Bengal].</rhi<></i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Seeds.<br>232                                                            |
| Hibiscus Sabdariffa, Linn.; Fl. Br. Ind., /., 340.<br>THE ROZELLE or RED SORREL of the West Indies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 233                                                                      |
| Syn.—? H. SANGUTNEUS, <i>Griff</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                          |
| <ul> <li>Vern.—Ldl-ambdri, patwa, HIND.; Mesta, patina, Idl-mista-bij, BENG.;<br/>Arak' kudrum, togot arak' (Revd. A. Campbell), SANTAL; Polechi,<br/>MAL. (S.P.); Ldla ambddi, SIND.; Lal-ambari, patwa, BOMB.; Ldl<br/>atnbdri, patwa, DEC.; Shivappu-kdshuruk-virai, shimai-kdshuruk-virai,<br/>Shivappwkdshuruk-kai, TAM.; Erra-gom-kaya, erra-gomgura, shima-<br/>gomgura, erra-gdngutru, erra-gdng-Mra, erra-gdng-dka, TEL.; Pula-<br/>chakiri, pundibtja, KAN.; Polecki, chivanna-pulachi-chira-vitta, MA-<br/>LAY.; Chin-poung-ni, ckinbaung, BURM.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 |                                                                          |
| <ul> <li>References.—Dale. &amp; Gibs., Bomb. Fl., Supp., 7 / Stewart, Pb. PI., 22;<br/>Trimen, Syst. Cat. Ceylon Plants, n; Pharmacog. Indie a, I., 212;<br/>Ainslie, Mat., Ind., II., 33s / O'Shaughnessy, Beng. Dispens., 12;<br/>Moodeen Sheriff, Mat. Med. of Madras, SO; Dymock, Mat. Med. W.<br/>Ind., 2nd Ed., 104; Murray, PI. and Drugs, Sind, 63; Bidie, Cat.<br/>Raw Pr., Paris Exh., No. 138; Mason, Burma and Its People, 756;<br/>Lisboa, U. PL Bomb., 14], 22?; Birdwood, Bomb. Pr., 140; Royle, Fxb*<br/>PI., 260; Liotard, Paper-making Mat., 5, 15, 16, 30; Atkinson, Ec.<br/>Prod. NW. P., Pt., V., 14; Saidape 5, Spons, Encyclop., 962; Balfour,<br/>Cyclop., II., 44; Smith, Die, 356; Kew Off. Guide to the Mus. of Ec.<br/>Bot, 18; Jour. Agri. 'Hort. Soc, VII., (New Series.) 224; Gazetteers:—<br/>Mysore and Coorg, I., 55, \$7 / Bombay, VIII., 184; XV., 428; Orissa,<br/>II., 180, App. VI.</li> </ul> | 1                                                                        |
| <b>Habitat.</b> —A small, elegant shrub, of which there are two varieties, one with red stems and a red succulent, edible calyx, the other with green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                          |

**Habitat.**—A small, elegant shrub, of which there are two varieties, one with red stems and a red succulent, edible calyx, the other with green stems and a green calyx. Widely cultivated throughout the hotter parts of India and Ceylon.

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|              | Dictionary of the Economic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| HIBI         | SCUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Sabda        | ariffa,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | The Rozelle Hemp or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| CULTI<br>TIO | IVA- METRONA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| Beng<br>234  | 4 In Bengal The Revd. A. Oampbell, in his Catalogue of the Econo-<br>sown with some other crops. <sup>10</sup> First Sown with some other crops. <sup>10</sup> First S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 23           | 4<br><i>mic Products of Chutia Nagpore</i> , writes : " Largely cultivated; generally<br>out in the ground at a distance of four feet from each other. The fruits<br>are ripe in November or Derember                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|              | sown with some other groups in writes :-" Largely cultivated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|              | out in the mount in the firminger source in the start generally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Burnt        | are ripe in November or December.<br>In Burma.—The Courteet from each other. The fruits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 235          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|              | Millormation be at a source ament has been and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | area under cultivation is 175 acres. It is sown in June and the following<br>well as the leaves are gathered in August and Sel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | Well as the loom - 10 dures. It is any the the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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|              | is R3, and the pt fi is the fore R2. The<br>digging a hole in ktosin depth. The an $F^*$ 10 state is .0000 planti<br>"Watthelh" if depth. The an $F^*$ 10 state is .0000 planti<br>every SurWf i * 15 " Pkntifi/al to T??" If im ding finit. In<br>jungles There is $T^{PoUnd}$ Jt is $5^{A}$ if $f^{CBnd}$ (wrilW 's, w near                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              | uigging a hole fit a «iore K <sub>2</sub> . The fore-iourun of an acre                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | Wattheln* f <b>Gepin</b> . Ine an <b>P</b> 1/2 south in the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | $\ll \gamma_0 - \chi_1 \approx 10^{\circ} \text{ K a } \text{ per } 1, \gamma_1 \approx 10^{\circ} \text{ Por } 1, \gamma_2 \approx 10^{\circ} \text{ Por } 1, \gamma_$ |
|              | every Surwit i * PKntin/al to I ?? In my taing mutt. In                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | jungles. There is $T_{ootdom}^{Pound}$ is $\bullet 5, \uparrow, \pm \frac{1}{5}$ is $\bullet 5, \uparrow, \pm \frac{1}{5}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|              | <pre></pre> <pre>&lt;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | yields a profit ? of $e_{D_{1}}^{WAII} f_{0}^{Y}$ and $f_{0}^{WAII} f_{0}^{Y}$ and $f_{0}^{WAII} f_{0}^{Y}$ and $f_{0}^{WAII} f_{0}^{Y}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|              | mor absut them "uut the film the syzif have a the outturn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | every Sur W I $i^{*}$ Pkntill/al to 1?? II im valing indit. In<br>jungles. There is $T^{PoUnd_jt}$ is $\cdot 5$ , $\cdot f_i^{f_i}$ fc and $ wri W_{i}$ , where $\cdot 1$<br><br><br><br><br><br><br><br>(a) There is $T^{PoUnd_jt}$ is $\cdot 5$ , $\cdot f_i^{f_i}$ fc and $ wri W_{i}$ , where $\cdot 1$<br><br><br><br>(b) the second of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | and the leaves $ar^*$ / $h^0$ out the the wet $ZUP$ / $h^0$ and the tender                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|              | «6. and the profit.K and $J$ if $I$ if $S \neq f$ about June,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              | , «re, nas Ken n 4- A der n <sub>eso</sub> n V 1 ? Nation is about                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | $\overset{a}{=}$ and $\overset{a}{=}$ and $\overset{a}{=}$ $\overset{a}{=$                                                                                                                              |
|              | Sinal extent III $f$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | A HWH II II J $2 as and private the table scale with the second value is 1 a + 1 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a + 2 a$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              | *e leaves $\bigwedge_{s}^{*} d_{a_{a_{a_{a_{a_{a_{a_{a_{a_{a_{a_{a_{a_$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | Per acr-, the $nr$ $T$ $T$ $T$ $T$ month, $T$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|              | <b>Ploughed</b> In $(J = A + KSU)$ The soli $(J = A + KSU)$ The soli $(J = A + KSU)$ and More defined to be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|              | $dalay Listriffh S \sim 10^{11} (% % % %). The full 2^{11} C_{OWn} is many red soil in April$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              | the Sheways Divit "Sivit cutting a When the more than the Man-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | Afrivit if if $J = 2/3$ and private $t' t' = t'$ is cultivated is<br>* e kaves $s': d^e a : V' in J' a a f f a g' t' about three months, but Per acr-, the nr T. Serone month. This T' = a a f a g' t' a bout three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but Ploughed In J^1 * "* R30. The soll A of cultivation three months, but and May, and is fit a g' t' g' the of the g' to the soll A of cultivation three months, but the Shewgys Divid "Siv It' cultivation three a generation the same system in D for S for min all the taungyas and in * " most It'' me fastmen in D assein the state of the same system in D assein the state of the same system in D assein A and A and the same system in D assein A and A and the same system in D assein the state of the same system in D assein the state of the same system in D assein the state of the state o$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|              | and the same system in D_ this cultivation to a versiter or less er-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| -W.          | $1 \rightarrow 1$ me tastm-n 1V $1 \rightarrow 1$ n of UDDor Burger erst< the Ru V Mines District.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| inces.       | $t^{0}$ 1's special f $\frac{1}{10}$ f7 / $t^{10}$ S $t^{10}$ S $t^{10}$ S $t^{10}$ f7 / $t^{10}$ S $t^{10$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 36           | succeedf >? margen of it $j_n$ n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| . 1          | succeedif Souter in the damp climate of lower India than in the upper<br>provinces, where the winter cold proves injurious.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ijab.        | In the Panish winter cold proven into a lower India than in the upper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 37           | Calvee whist offewart writer of hijurious.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| bay.         | jab, but even at the excellent jelly. The cultivated for its succellent acid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 38           | In Bomban - Dere the seeds hardly come to maturity in the Pan-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | In Bombay.—Regarding this Presidency the Acting Director of Land<br>Records and Agriculture has furnished the following :—"This is found in<br>sown in the borders of garden land the following :—"This is found in<br>in November to garden land the following in the prove selfe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | gardene new "Structure has furnished the Acting Director of Land                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | sown in the borders of garden land. It grows 3 to 4 feet high, and fruits<br>It is also grown in kitchen gardens in the land for about seven months.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | in November to D garden land. It mularat, where it grows self-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | It is also grown in Livember, occupying the live 3 to 4 feet high, and fruits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1            | in November to December, occupying the land for about seven months.<br>It is also grown in kitchen gardens in the cold season. It is sown thickly<br>vielding and Food Plants.<br>In Madros. The State of State of State of State.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1            | uve of fruit." Lishoe is sparingly. This mode season. It is sown thickly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| as,          | yielding and Food Plants.<br>In Madras, This mode of culture is most produc-<br>In Madras, The Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | tive of fruit." Lisboa incidentally mentions the plant in his Lists of Fibre-<br>In Madros. —In the Selections from the Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|              | In Madros. In the Selections from the Records of the Madros Gov-<br>ernment published in 1856, information regarding the cultivation and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|              | H. 239                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | - Saturng the cultivation and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Red 'Sorrel of the West Indies. {J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | HIBISCUS<br>Sabdari <u>ffa</u> |
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| method of preparation of the fibre is furnished, and it appears that even<br>at that time the commercial value of Rozelle was recognised. The reports<br>then called for show, however, that the plant was grown only to meet the<br>local demands for the fibre and fruit; but of several districts the remark<br>was made that should a demand arise, any quantity could be produced<br>on waste lands, as the crop grew with little care or attention.<br>The following recent reports may be quoted :—In the <i>Madura District:</i><br>"The extent of cultivation is probably 50 acres. It is not cultivated sepa-<br>rately but mixed with <i>cholam, ragi,</i> onions, &c, in gardens. No expen-<br>diture is separately incurred on account of this cultivation. It is sown in<br>August and March, and reaped in November and December. One acre is<br>said to yield one maund of fibre costing R1-4. <i>In Cuddapahi</i> "It is<br>grown in the western parts of the district, is a nine months crop, and is<br>sown in January. The cost of cultivation is R5 per <i>cawny,</i> and the<br>profit is Rio. The extent of cultivation cannot be given."                                                                                                                                                                                                                                                                                                           |                                |
| The following account is quoted from the Report of the Madras Experimental Farms for 1875 :—'' A plot of land, 1,210 square yards, was sown with rozelle seeds. The soil was a free sandy loam. It was prepared for the crop in the following way: twice ploughed, once harrowed and ridged then manured with 3J cart-loads of farm manure, and again ridged over the manure; on the 1st February 6fb of seed was sown on the ridge. During the growth of the crop the land was once hand-hoed, once bullock-hoed, and eighteen times irrigated. The seed germinated well and the plants grew with great vigour; they were straight and almost without side branches, and averaged between 5 and 6 feet high when ready for cutting, about three months after being sown.'' Fibre.—The stems yield a good, strong, silky FIBRE, the Rozelle Hemp of Commerce, obtained by retting the twigs when in flower. The process is described as follows in a statement from the N el lore District of Madras : ''After the plants are supposed to be properly dried, they are r>ade into bundles and soaked in water, in which state they are allowed to remain for a period varying from 15 to 20 days. After that time the bark is separated by the hand, and well washed to free it from any impurities; it is then allowed to dry, and becomes available for use.'' It is employed by the natives for the purposes of cordage, being twisted into a rope of varying thickness. | FIBRE.<br>240                  |

for the purposes of cordage, being twisted into a rope of varying thickness called *ntlaka*. The thinner varieties of rope are substituted for tape and rattaning for cots, the thicker is generally employed as a strong rope, for agricultural purposes, tying up cattle, &c. The fibre is also said to be employed in the manufacture of gunnies in certain districts of Madras.

Liotard (Paper-making Materials of India) mentions the Rozelle as yielding a fibre likely to be valuable to paper-makers, but no account exists of its actually having been so employed. On the whole, considering the easy growth of the plant and the cheap rate at which it could be procured, the fibre seems worthy of more attention than it has hitherto received.

Oil.—An OIL is prepared from this plant at the Allahabad Jail, of the preparation and economic uses of which, however, the writer has no information.

Medicine.—The SEEDS of the Rozelle are used medicinally, and have MEDICINE Seeds. demulcent, diuretic, and tonic properties. A decoction of them is recom-mended by Moodeen Sheriff as a draught, in doses of from one to two drachms, three or four times a day, in cases of dysuria and strangury, and also in some mild forms of dyspepsia and debility. The authors of the Pharmacographia Indica observe: "In this plant we have the emollient and demulcent properties of the Malvaceae, combined with a large amount

OIL. 241

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| HIBISCUS                                          | A useiul Cordage Fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| tetraphyllu                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| MEDICINE.                                         | of acidity, which stimulates, and at the same time neutralizes, the bilious secretion."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Fruit.                                            | From the FRUIT (or rather succulent calyx) a drink may be made, which                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 243                                               | is useful in biliousness, by boiling it with water and adding a little salt, pep-<br>per, assafoetida, and molasses, and for convalescence, or in mild cases of<br>fever, an acid refreshing drink may be prepared from it. The French use<br>it in the manufacture of an astringent syrup.<br>A general consensus of opinion also appears to exist regarding the<br>valuable antiscorbutic properties of the fruit, either fresh or dried. With<br>reference to this, it may be of interest to give here the following analysis<br>of its chemical composition originally published by Dr. Lyon : Water 8*29<br>hot water extract 65-96, cellulose 7-68, ash 6*32, the alkalinity of which<br>calculated as potash, was 75, tartaric acid 9*9, and malic acid J5"54 P <sup>en</sup> |
| Leaves.                                           | cent. No citric acid was detected.<br>The LEAVES are regarded as emollient.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 244                                               | SPECIAL OPINIONS.—§" It is also considered to be antiscorbutic taken<br>in the form of <i>Chatrice.</i> " (Surgeon Anund Chunder Mukerji, Noakhally<br>Bengal,) •• It is eaten with curry as an acid like tamarinds, &c. The<br>dry calyx is an article of commerce." {Dr.Dymoch, Bombay.) "Mesta'is<br>a good antiscorbutic. Its different preparations are now much used in<br>Bengal Jails." {Surgeon R. L. Dutt, M. D., Pubna)                                                                                                                                                                                                                                                                                                                                                   |
| FOOD ft                                           | Food and Fodder.—The fleshy CALYX and CAPSULE are largely made                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FODDER.<br>Calyx.                                 | into jam and other preserves, and in the fresh state are very acid but<br>refreshing. A decoction of them, sweetened and fermented, is commonly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>45</b> ,                                       | called in the West Indies '• Sorrel drink." The LEAVES are used in salads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Capsule. <b>246</b>                               | and by natives in their curries, a fact alluded to by Strattel in his Narra-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Leaves.                                           | <i>tive of Travels in Burma.</i><br>The SEEDS are said to be an excellent food for cattle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Seeds.                                            | Trade.—The FIBRE is as a rule extracted only for local consumption                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 248                                               | and the^amount of profit derived may be found under the heading *' Culti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| teade.<br><b>249</b>                              | vation. <sup>^</sup> The FRUIT is sold in most bazd>s either in the fresh or dry'state<br>The wholesale price of the fruit is given by Moodeen Sheriff as R8 p <sup>e</sup><br>maund, and the retail or baza'> price as annas 5 per pound.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 250                                               | Hibiscus surattensis, £*'»«./ Fl <sub>%</sub> Br. Ind., 1., 334; Wight, Ic, 1.197<br>SynH. FURCATUS, Wall., not of Roxb.<br><sup>Ve</sup> ?S-—R <sup>h</sup> , H. BOMB.; Kashlikire, TAM.; Mulu gogu, TEL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                   | Welma chinpoung, BURM. ; Naapiritta, hin-ndpiritta, SING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                   | References. Roxb., Fl. Ind., Ed. C-B C. SZT; Tkwaites, En. Ceylon PL<br>%, - <sup>Dal</sup> 2z, <sup>Bomb</sup> - Pl-> 20/Trimen, Cat. Ceylon Plants, n;<br>Elliot, Fl. Andhr., 119., Lisboa, U. Pl. Bomb., 227; Balfour, Cyclop.<br>II.% 44.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                   | Habitat—A weak-stemmed, trailing plant, covered with soft hairs and scattered prickles, found in the hotter parts of India from Bengal to Penang, also in Ceylon.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| FIBRE.<br>Bark.<br><b>25X</b><br>FOOD.<br>Leaves, | Fibre.—Lisboa mentions this plant in his list of those yielding fibre<br>but beyond observing that the fibre from the BARK is strong, he gives u<br>no information on the subject. **<br>Food.—According to Balfour the LEAVES are used as greens.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 252                                               | H. tetraphyllus, Roxb.; Fl. Br. Ind., /., 341.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 253                                               | Syn—H. CANARANUS, <i>Miq.;</i> BAMIA TETRAPHYLLA, <i>Wall.;</i> ABELMOSCHU<br>^TRAPHYLLUS, <i>Grah.;A.</i> WARREENSIS,Z>a/*.;ERBBENNUS CANARANUS<br>Greid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                   | VernRdn-lhenda, MAR.5 Ong-kd-to, BURM.<br>RefeRdn-lhenda, MAR.5 Ong-kd-to, BURM.<br>Fi.TMS.*Rbox FL Ind,, Ed, CBC., 529; Dalz, & Gibs,, Bomb,<br>Fi.TMS.*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                   | Н. 253                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Á useful Cordage Fibre, ( <b>F</b> . Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | HIBISCUS<br>tricuspis.                                                                                                |
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| <ul> <li>Habitat.—An erect, large, racemose, annual species, from 4 to 6 feet high, found in Bengal near Calcutta, and in Concan and Kdnara. Fibre.—Is said to yield a tough fibre, regarding which, however, definite information is wanting.</li> <li>Hibiscus tiliaceus, Linn.; Ft. Br. Znd., 343; Wight, Ic, t. 7.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FIBRE.<br>254<br>255                                                                                                  |
| <ul> <li>Syn.—PARTIUM TILIACBUM, W. &amp; A.</li> <li>Veril.—Bola, chelwa, BENG. ; Banid, orbarid, ORISSA ; Belli-pata, BOMB.;<br/>Thinban, thengben, BURM.; Beligobel, belipattd, SING.</li> <li>References.— Roxb., Fl.Ind., Ed. C.B.C., 522; Kure, For. Fl. Burnt, I,<br/>126; Beddome, Fl. Sylv. Anal. Gen., 74; Gamble, Man. Titnb., 42;<br/>Thwaites, En. Ceylon PL, 26; Dais. &amp; Gibs., Bomb. Fl., 17; Irvine,<br/>Mat. Med. Patna, 123 ; Hunter, Orissa, II., 17 S* App. VI; Lisboa, U.<br/>PI. Bomb., 75, 194, 227 ; Christy, Com. Pl. and Drugs, VI, 33 / Royle,<br/>Fib. PI., 261; Watt, Hibiscus in Sel. from Rec. ofGovt. of Ind., Rev. &amp;<br/>Agri. Dept., 1889, 273 / Indian Forester, XII., 329 / XIV., 269.</li> <li>Habitat.—A much branched bush of the Coasts of India, Burma, and<br/>Ceylon. Particularly plentiful in the Sundarbans, and on the rivei banks<br/>of Burma. The ease- with which this plant might be propagated over<br/>wide tracts of swampy country, where little else will grow, should afford a<br/>powerful incentive to an effort being made to utilise the fibre it affords.<br/>Fibre.— Dr. Watt, in his paper on Hibiscus already referred to, writes<br/>of this species that it "yields a useful fibre, extensively employed locally<br/>for cordage. It is said to gain in strength when tarred. Roxburgh's<br/>experiments with this fibre gave the following results :—A line broke when<br/>white with a weight of 41ft, after being tanned with 62ft, and after having<br/>been tarred with 61 ft. A similar line macerated in water for 116 days<br/>broke when white with 40ft, tanned 55ft, and tarred 70ft. These obser-<br/>vations are of great interest, for, of the other fibres experimented with by<br/>Roxburgh, the majority were rotten after macerated in the same manner, were<br/>found to be rotten, and Sunn-hemp broke with 65ft, and Jute with 60ft.<br/>The power of endurance under water is, therefore, a point of great im-<br/>portance.</li> </ul> | FIBRE.<br>256                                                                                                         |
| The fibre is readily separated from the green or unsteeped branches,<br>the work of preparation being less tedious than applies to the other fibre-<br>• yielding plants of this genus. It appears to be well adapted for making<br>ropes, mats, and possibly paper ( <i>Cameron</i> ). The fibre seems highly suit-<br>able for the paper trade, and immense quantities of it might be conveyed<br>in boats to the paper mills of Bengal."<br>Medicine.—The BARK is used in medicine. The ROOT is also said by<br>Irvine in his <i>Materia Medica of Patna</i> to be febrifuge, and employed in<br>the preparation of embrocations.<br>Food.—Forster states that the BARK is sucked in times of scarcity when<br>the bread fruit fails.<br>Structure of the Wood.—The wood is only employed in India as fuel.<br>If is said to be used in Tahiti, however, for planking and building light<br>boats.<br><b>H. tricuspis</b> , <i>Banks; Fl. Br. Ind., /., 344</i> .<br>Syn»—PARITIUM TRICUSPK, <i>G. Don.</i><br>Vein.— <i>Gurhul</i> , HIND<br>References.— <i>Roxb., Fl. Ind, Ed. C.B.C., 526; Kurz, For. Fl. Burm., I.,</i><br><i>126 / Gazetteer, Mysore and Coorg, I., 57.</i><br>Habitat.—A tree, introduced from the Society Isles, cultivated in<br>gardens in Bengal and the North-Western Provinces.<br><b>H. 261</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MEDICINE.<br>Bark.<br><b>£</b> <sup>5</sup> ?<br>Root.<br>258<br>F <del>259</del> .<br>Bark.<br>TIMBER.<br>260<br>261 |

| HIDES.                              | Hides and Skies. <sup>6</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| FIBRE.<br>262                       | Fibre.—A strong bast-like FIBRE is obtained from the inner bark of the trunk, and branches. A sample produced at Bangalore was prepared by steeping in water for 13 days <i>{Cameron)</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 263                                 | HibisCUS Vitifolius, Linn.; FL Br. Ind., /., 338.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                     | Syn.—HIBISCUS OBTUSIFOLIUS, Willd. / H. TRUNCATUS, Roxb.; H. SERRA-<br>TUS, Wall; H. CUSPIDATUS, Edgew,<br>Vm.—Ban-kdpds, BENG. \ Karu-patti, TEL. J Bhdradvd/i, venakdrpasa,<br>SANS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                     | References.—Roxb., FL Ind., Ed. C.B.C., 525; Kurs, Paper on Burmese<br>Flora, injourn. As. Soc. of Bengal, i874,XUf/, Pt. II., 108; Thwattes,<br>En. Cy on PI., 26; Dais. & Gibs., Bomb. FL, 20; Elliot, FL Andhr.,<br>87; U.C. Duit, Mat. Med. Hind., 294, 322; Coss, Bevan and King,<br>Rrp. on Indian Fibres, 41; Indian Forester, XIV., 26y; Gasetters:-<br>Mysore and Coorg, I., 57; Bomb. XV., 428; NW. P., I.f 79; IV.,<br>Ixviii,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                     | Habitat.—A common, herbaceous bush, in the jungles and brushwoods<br>of the hotter parts of India, from the North-West Provinces to Ceylon. It<br>bears large yellow flowers having a deep rose purple eye at the base of the<br>corolla. The leaves are often much perforated by insects. Kurz, in the<br>paper quoted in the references, describes it as common along borders of<br>helds, in shrubberies, rubbishy places round villages, 8rc, also in dry<br>forests, all over Burma from Chittagong and Ava down to Pegu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FIBRE.<br>Bark.                     | Fibre,—I he BARK yields a strong silvery fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 264                                 | HIDES & SKINS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 265                                 | i • <sup>The</sup> r <sup>1</sup> l <sup>ame Hides comn</sup> *ercially comprises the raw, dressed or tanned,<br>skins of the cow, bullock, or buffalo, while the term Skins is applied to<br>those of goats, deer, and animals other than horned cattle. For a full list<br>of these tile reader is referred to the articles on Furs and Skins.<br><b>Vern.</b> – <i>Chamrá</i> , HIND.; <i>Toll, tolu,</i> TAM.; <i>Tol, tolu,</i> TEL.; <i>Balullang,</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ſ                                   | <ul> <li>kulit, MALAT.; Charma, SANS.</li> <li>References. — Royle, Prod. Res., 3; Spons, Encyclop., 1757; Balfour.<br/>Cyclop., 11., 44; Madras Manual of Administration, 1., 360; Settlement<br/>Reports :- Asamgarh, NW. P., 171; Yubbulpore, Central Prov., 87;<br/>Bombay Administration Rept., 1871-72, 372-374, 378, 380, 387, 394, 398;<br/>Gasetteer, Skahpur, 74; Statistics on Hides and Skins, Rev. and Agri.<br/>Dept., 1886.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| trade.<br>266                       | Trade.—The whole question of the production and preparation of<br>hides and skins may be most conveniently discussed under this heading.<br>The trade in these articles is now a very large and important one,<br>and has expanded considerably during the past few years.<br>The production is a second to be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Traders In<br>Hides.<br><b>267</b>  | commenting n« Vc • $m^{ea}v^{a**}$ or of the country at arge. mr, ww«i<br>^ iS w^ wS J ^ Ti 11? $C_2^{2iew}$ of the Sea-born! Trade Returns<br><i>Muhammacans</i><br>^ Hindus will not deakin hides by reason of religious oreiudices), and some<br>of these near are very weathy, fon the 'tradfish' h' (*) v profitable one.<br>W J - X I K · <i>T</i> + <i>x</i> + <i>y</i> + |
| Cattle-<br>polsoning.<br><b>268</b> | when do $\mathbf{n}^{\text{A*'''K*}}$ -r:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Trade in Hides and Skins. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | HIDES.                            |
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| poison, and these beasts represent an actual loss to the country which out-<br>weighs the value of the whole number of hides put together. " There is<br>little doubt that the same state of things still prevails, and as the trade<br>has much increased, it is to be feared that it must exist to a still greater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TRADE.                            |
| extent.<br>On referring to the Inter-Provincial trade returns it is found that much<br>the largest exporters, as far as hides are concerned, are the North-West<br>Provinces and Oudh, and that next to these come the Pan jib and Central<br>Provinces, trom the two former numerous dressed hides are exported,<br>owing to a considerable and increasing tanning industry, especially at<br>Cawnpcre. The Panjab and Central Provinces, on the other hand, supply<br>principally the undressed material. The hides (raw and dressed) exported<br>from Jhe North-West Provinces are nearly all sent to Bengal; the skins<br>which are for the most part undressed are sent to Madras. Bombay<br>imports the greater part of its hides, both raw and dressed, from the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Inter-Pro-<br>vincial Trac<br>269 |
| Central Provinces, its raw skins from Rájputana and Central India, and<br>its dressed skins from Madras, the Panjáb, Rájputana, and Central India.<br>The following quantities of hides and skins, dressed and undressed, con-<br>veyed by road, rail, &c, from the provinces named, in 1886-87, may be<br>given for the sake of compaiison:—North-West Provinces and Oudh,<br>">79*7 <sup>1</sup> 3 mounds, Panjab 1,69,086 maunds, Rajputana and Central India,<br>^7>7°5 maunds (principally skins), Mysore 62,511 maunds, Nizam's<br>territory 51,036 maunds, Central Provinces 42,351 maunds (principally<br>undressed hides), Sind 21,148 maunds, Berar 17,738 maunds. Besides<br>these sources of supply, Bengal, Madras, and Bombay yearly send large<br>consignments to their respective capitals and ports, Bengal alone supply-<br>ing 3,33,446 maunds of dressed hides to Calcutta. During the same year<br>the following were the imports by road, rail, and river, of hides and skins<br>into the principal shipping towns: Calcutta 8,24,459 maunds, Madras<br>4,19,094 maunds, Bombay 74,423 maunds, Karachi 51,261 maunds. Of<br>its hides Calcutta obtained 25,32,412 in number from Behat. 23,97,199<br>from Bengal, 11,48,864 from the North-West Provinces, and smaller   | By road ar<br>rail, &c<br>270     |
| numbers from the other districts above named.<br>A review of the coasting trade for the same year shows that Calcutta<br>imported 40,637 cwt., and exported 47,671 cwt. Madras imported 55,598<br>cwt., and exported 48,450 cwt. Bombay imported 33,274 cwt., and ex-<br>ported 4,441 cwt. Sind imported 1,032 cwt, and exported 25,089. Burma<br>imported 3,765 cwt, and exported 7,52s. On analysing these figures it<br>will be found that the principal part of Calcutta's imports consists of raw<br>hides from other ports within the Presidency, the greater part of those of<br>Madras also consisted of raw hides from British ports within the Presidency,<br>but it also received 17,353 cwt. of raw skins from Bengal, presumably to<br>be tanned and re-exported as the more valuable Madras article. Of Bom-<br>bay's total import of 33,274 cwt., 26,422 cwt. consisted of raw skins from<br>Sindh. The greater part of the coasting exports of Calcutta were 27,337<br>cwt., to other British ports within the Presidency, and the raw skins to<br>Madras already referred to. Madras also sent 22,910 raw hides to other<br>ports in the Presidency, while Sindh exported the large number of raw<br>skins above mentioned to Bombay. The coasting exports of the latter port |                                   |
| were unimportant.<br>The Trans-Frontier trade has considerably increased during the past<br>few years, the largest source of hides being Upper Burma, of skins<br>Kashmir and Nepal. The total Import trade of hides for 1886*87<br>was 95,186 pieces, 59,866 cwt., valued at R17,73*241, a very great<br>increase on the imports of 1881-82, which only amounted to 5J lakhs of<br>rupees. That of skins for the same year (1886-87) was 71,103 pieces,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ]                                 |

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| HIDES.                       | Trade in Hides and Skins.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| TRADE.<br>Imports.<br>273    | 5,04.0 cwc, valued at 82,11,796, while the value of this import in 1884-8 was only 81,27,541. The very great increase in trans-frontier trade is mainly due to the large imports from Upper Burma, the Burmans havin evidently discovered that, with increased facilities for intercourse and trade, their formerly valueless cattle hides might form an article of larg and profitable commerce. In 1881-82, the imports from Burma valued only 3! lakhs of rupees; last year they amounted to 13} lakhs, or mor than \$rds of the total trans-frontier hide imports-                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Exports.<br>274              | The Trans-Frontier export trade in hides appears to be decreasing<br>thus in 1884-85 it amounted to 1*24,093, in 1887-88 it was only Ri4.033,» <sup>0</sup><br>little more than half. The export trade in skins is a small and fluctuatin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| xports from<br>India.<br>275 | one, and amounted to only R 19,599 in 1886-87.<br>A review of the statistics, relating to the exports of hides and skin<br>to Foreign countries, shows that a marked increase has taken place during<br>the past ten or twelve years, due principally, during the last few years, to<br>greatly increased activity in the skin trade, while that in hides appear<br>to be falling off. Thus in 1887 the total value of exports amounted to<br>84,85,23,818, an increase of more than 100 lakhs of rupees on that o<br>1877-78, which valued 83,75,68,878. The greatest increase is seen to b<br>in the export of dressed skins, which has risen in value from 92 lakhs in<br>1877-78, to 192 lakhs ten years later. The value of undressed hid<br>exports increased 30 lakhs, and that of raw skins 10 lakhs, while the<br>exports of dressed hides decreased 30 lakhs.                                                                                                                                     |
| •                            | Analysing these statements it is found that during the same ten year<br>the value of exports from Bengal, increased from 81,72,13,905 to<br>R2,07,68,574; from Bombay it decreased from 856,75,427 to 846,17» <sup>1</sup> *°j<br>from Madras it became during the same period very greatly augmented<br>namely, from 81,46,59,521 to 82,07,26,638, the total value having thus<br>become very little short of that of Bengal; from Sind it increased from 4 <sup>t</sup><br>to 9! lakhs, and from Burma it rose from   lakh to ui lakhs of rupees<br>Bengafoppears to have almost a monopoly of the export trade in raw<br>hides and skins, while Madras, as might be expected from the excellence<br>of its tanning, exports nearly all the dressed hides and skins. With<br>reference to this, the most important export trade of Madras, the following<br>passage from the Madras Manual of Administration, Vol. I., may be<br>quoted : "The tanning and export of skins have become of late years very |
|                              | large industries in South India, and Madr&s dressed skins are well known<br>and highly appreciated both in European and American markets. In<br>fact, South Indian skins fetch so much higher a price than those shipped at<br>other ports in India, that salted hides are sent from Bengal to be tanned<br>and exported from Madras. The superiority of the Madras article is<br>partly due to the fine quality of the bark used for tanning it, and partly to<br>the superior methods of manipulation. The bark is obtained from a<br>small shrub, Cassia auriculata (see Vol. //., 2/5), which grows wild all<br>over the country and is in great demand."                                                                                                                                                                                                                                                                                                                                               |
| Foreign<br>markets.<br>276   | Turning to the markets to which these exports are shipped, it is found<br>that by far the largest importer of Indian raw hides is the United Kingdom<br>which, in 1887-88, imported to the value of 81,21,57,552. Next in import-<br>ance is the United States with an import valued at 24 lakhs; then Italy with<br>19 lakhs, followed by Austria with i6£ lakhs, and the Straits Settlements<br>with 11 lakhs. Regarding the Italian export trade, Mr. O'Conor, in his<br>Report on the Trade of India for 1888-89, writes: "The British Consul at<br>Venice reports that there was a decline there in the price of Calcutta<br>hides, 'which are alleged to be of inferior quality and are gradually losing<br>favour with merchants.' In this case the matter is of some importance,<br>for the exports of hides to Italy has been a large trade, and it seems to be                                                                                                                                    |

| The Sea Duckthorn. (J. Marray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | IPPOPHAE<br>amnoides            |
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| declining." The statement is confirmed by statistics, for, since 1885-86, the exports to that country have decreased from 36-96 lakhs of rupees, to 19*27 lakhs in 1887-88, ahd 1914 in 1888-89. Smaller quantities are shipped to many other countries, including France, Germany, Belgium, Greece, and Egypt, but doubtless a great proportion of the immense consignments to the United Kingdom are reshipped to continental ports. In the case of dressed hides the only direct importer of any consequence is alsotfie United Kingdom, which receives an amount valued at R60,40,222 out of a-total export valued at {(60,58,092) On the other hand, Indian raw skins are imported in much the greatest quantities by the United States of America, which, in the year under consideration, imported a quantity valued at 1^27,22,314 out of a total export of 30^ lakhs. Or dressed skins the United Kingdom again receives much the largest proportion, valued R 1,52,07,141, out of a total of R 1,92,08,570, and the United States of America comes next with an import valued at 19 lakhs. Thus in the year under consideration the United Kingdom alone imported Indian hides and skins, dressed and undressed, to the value of R3×3 <sup>6</sup> ×5 <sup>5</sup> × 9 <sup>9</sup> ut of the total export of 84,85,23,818. The foregoing short account of the present state of the hide and skin trade in India shews that a steady increase is taking place, especially in the industry of dressing skins. There seems certainly to be a large and profitable field for this branch of Indian trade, and it is to be expected that the acknowledged expertnees in manipulation of the tanners of Southern India may enable them, with improvements in the methods or preparation, to supply skins of such a quality as to still further increase the present great demand. | TRADE IN<br>HIDES AND<br>SKINS. |
| For a description of the methods of preparation and respective eco-<br>nomic values of various SKINS, the reader is referred to the article on that<br>subject, and for similar information regarding hides to that on LEATHER.<br>Hing, see Ferula alliacea, <i>Jtoiss.</i> , Vol. III., 333.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ,                               |
| Hippion Orientate, s <sub>ee</sub> Enicostema littorale, <i>Blutne</i> , Vol. III., *45-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                 |
| HIPPOPHAE, Linn.; Gen. PL, III., 204.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                 |
| A genus of dioecious shrubs or small trees belonging to the Natural Order EuEAGNACE;*, and comprising two species found in Europe and North Asia, both of which are natives of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                 |
| Hippophae rhamnoides, Linn.; Fl. JBr. Ind., V., 203;<br>THE SEA BUCKTHORN [ELEAGNACE^:<br>Syn.—HIPPOPHAE TIBETANA, Schlecht.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 277                             |
| Vern.—Dhurchuk, tdrwd, chuk, chuma, NW. P.; Kola bisa, bant phut,<br>amb, tswak, kando, tserkar, starbu, milech, miles, siits, rul, tsannang,<br>tsuky tsarap, sirma, tarru, tsarnta niechak (fruit, tirkti), PB; Star-bu,<br>TIBETAN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                 |
| References.—Brandt <sup>\$</sup> , For. FL, 388; Gamble, Man. Timb., 3'7; Stewart,<br># Pb. PL, 1 go; Cleg horn, Panjdb Forests, 15 r; Aitchison, Fl. Lahoul<br>{Lin Soc.Jour., X., 75), also Fl Kuram Valley, Q2; Ind. For., XI., 4;<br>Balfour, Cyclop., II., 85 / Smith, Die, 67; Treasury of Bot., /., 592.<br>Habitat.—A thorny shrub, cr small tree, met with in the inner tract of<br>the North-West Himalaya, and Western Tibet, chiefly in moist, gravelly<br>stream-beds, from 7,000 to 15,000 feet; distributed to Afghanistan and<br>westwards to North and Central Asia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                 |
| Medicine.—The small sour FRUIT IS prepared as a syrup, and is believed<br>by the natives of many parts to be a valuable remedy for lung complaints.<br>Stewart mentions it as thus employed by the Tibetans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE.<br>Fruit.<br>278      |

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| HIPTAGE<br><b>Madablot</b> |                                                                                                                                                                                                              |
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| FOOD.                      | <b>Food.</b> —The small intensely acid FRUIT may be made into a good jelly                                                                                                                                   |
| Fruit.                     | which Aitchison describes as really excellent when prepared with half it                                                                                                                                     |
| 279                        | weight of sugar. It is, however, only eaten by the natives in certain localities                                                                                                                             |
|                            | thus Longden mentions it as eaten by the natives of Kanawar as a sort of <i>ckatni</i> , while Aitchison remarks that in Lahoul it is not employed                                                           |
|                            | at all as an article of food. Smith, in his Dictionary of Economic Plants                                                                                                                                    |
|                            | erroneously describes it as acrid and poisonous.                                                                                                                                                             |
| TIMBER.<br>Fuel.           | Structure of the Wood.—Heartwood yellowish brown, mottled, moder                                                                                                                                             |
| 280                        | ately hard, close-grained. Weight 38 to 54ft per cubic foot ( <i>Gamble</i> ). In the dry almost treeless tracts of the Inner Himalaya it is very valuable as                                                |
| 200                        | a fuel and charcoal-supplying plant; indeed, so much is it esteemed in these                                                                                                                                 |
|                            | districts, that, as Cleghorn mentions of Lahoul, it is considered village                                                                                                                                    |
|                            | property. The thorny branches are also employed, piled up,^to form                                                                                                                                           |
| 281                        | hedges or fences.                                                                                                                                                                                            |
| 201                        | Hippophae salicifolia, Don.; FL Br. Ind., V., 203.<br>Syn.—H. CONFERTA, Wall,                                                                                                                                |
|                            | A considerable amount of doubt may be entertained as to whether this species is                                                                                                                              |
|                            | really distinct from the former. The vernacular names of the two are identical, and the parts of the plant are similarly employed for accommis surpass. Thus Starward                                        |
|                            | the parts of the plant are similarly employed for economic purposes. Thus Stewar<br>only recognises H. rhamnoides, while Atkinson and Baden Powell describe                                                  |
|                            | only H. salicifolia, giving the same vernacular names, habitat, and uses. Hooker                                                                                                                             |
|                            | though acknowledging the two species, remarks, "different as this plant looks in its<br>ordinary condition from H. rhamnoides, I expect that it will prove a form of that                                    |
|                            | plant, due to the moister climate which it affects," an opinion which was also pro                                                                                                                           |
| 1                          | mulgated by Brand is in his Forest Flora. As most modern writers, however, have                                                                                                                              |
| ł                          | agreed in separating the two species, the following facts may be given as most prob-<br>ably referable to this form :—                                                                                       |
| Í                          | Vern.—Ashiik, NEPAL; Lhdla, BHOTAN, LEPCHA; Sfrch, BASSAHIR;                                                                                                                                                 |
|                            | Surch, sats, kdld bis, tserdkar (Baden Powell), dhur-ckuk, tanva-chuk, chuma, PB.                                                                                                                            |
| ~                          | References.—Brandtš. For. FL, 387 : Gamble, Man. Timb., 3t7 : Royle,                                                                                                                                         |
|                            | III. Him. Bot. 323; Baden Powell, Pb. Pr., 272,582; Atkinson, Him.<br>Dist., 3i6 ; Indian Forester, V., 186 ; XI., 4 ; Balfour, Cyclop., 11., 85 ;<br>Settlement Report, Kangra, 163 ; Gazetteer, Simla, 12. |
| İ                          | Settlement Report, Kangra, 163; Gazetteer, Simla, 12.                                                                                                                                                        |
|                            | Habitat.—A willow-like shrub, from 10 to 20 feet in height, found<br>in the Temperate Himálaya, from Jamu to Sikkim, between the altitudes                                                                   |
|                            | of 5,000 and 10,000 feet.                                                                                                                                                                                    |
| MEDICINE.<br>Fruit.        | Medicine.—The FRUTT is mentioned by Baden Powell as being em-                                                                                                                                                |
| 282                        | ployed, like that of the former species, in cases of lung disease.<br><b>Food.</b> —The ripe FRUIT forms a good jelly or syrup, when prepared with                                                           |
| FOOD.<br>Fruit.            | sugar. When unripe it is very acid and unpalatable.                                                                                                                                                          |
| 283                        | Structure of the Wood.—The thorny branches, cut and dried, are em-                                                                                                                                           |
| TIMBER.                    | ployed to make piled-up hedges, and also as fuel.                                                                                                                                                            |
| 284                        | Hips, see Rosa canina, Linn. ROSACES. ; Vol. VI.                                                                                                                                                             |
|                            | HIPTAGE, GcBrtn.; Gen. PL, I, 258.                                                                                                                                                                           |
|                            | A genus of climbing or sub-erect shrubs, or trees, belonging to the MALPI-<br>GHIACEJE, and embracing five tropical Asiatic species. [JQ y MALPIGHIAG#JE.                                                    |
| 28s                        | Hiptage Madablota, Gartn.; FL Br. Ind., /., 418; Wight, III., t.                                                                                                                                             |
|                            | Syn.—MOLINA RACEMOSA, Lamk.; CERTNERA RACEMOSA, Roxb.; BANIS-                                                                                                                                                |
|                            | TERIA BENGALENSIS, <i>Linn.</i> ; B. UNICAPSULARIS, <i>Lamk.</i> ; B. TETRAPTERA, <i>Sonnerat.</i>                                                                                                           |
|                            | Vern.—Kampti, madmalti, mddhavilatd, HIND.; Madúbhi, maddbhMta,                                                                                                                                              |
| 1                          | mddhavilatd, hos-anti, BENG.; B oro malt, URIYA; Shempati, NEPAL/                                                                                                                                            |
|                            | Aita-lugala, \lVJ. P.; Endra, chopar, benkar, khumb, chdbuk, churt, PB.; Kampti, C. P.; Haladwail, MAR.J Mddhavi tige (Elliot), vadla-                                                                       |
| 1                          | yardla,pdtuvadla, TEL.; AH muktamu, SING. ; Mddhavi, SANS.                                                                                                                                                   |
|                            | H. 285                                                                                                                                                                                                       |
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| The Wild Hog.   (f Murray!)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | HOG.                                                              |
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| <ul> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 360; Brandts, For. Fl., 44;<br/>Kurzy For. Fl. Burnt, I., 173; Gamble, Man. Timb., §8; Stewart, Pb.<br/>PL, 30; Rheede, Horl. Mai., VI., t. S9; Elliot, Fl. Andhr., 17, 109, 757,<br/>188; Moodeen Sheriff, Supp. Pharm. Ind., 154; Mat. Med. of Madras,<br/>70; U. C. Dutt, Mat. Med Hind., 308; Murray, PI. and Drugs, Sind,<br/>68; Atkinson, Him. Dist., 306,739; Indian Forester, VI., 240; XIV.,<br/>391; Bnlfour, Cyclop., II., 86; Works of Sir W. Jones, V., 123; Journal<br/>A. H.Soc. of Ind. XIV., 33; Gazetteers :—NW. P., I., 79; Iv., lxix<br/>Bombay, XV., 428; Mysore and Coorg, I., 58; II., 7.</li> <li>Habitat.—A common climbing shrub with beautiful and fragrant<br/>flowers, found in the hotter parts of India, Burma, and Ceylon.<br/>Medicine. —The LEAVES are esteemed useful in cutaneous diseases, and<br/>the JUICE is specially mentioned by Moodeen Sheriff as an effectual<br/>insecticide, and a valuable application in scabies.<br/>SPECIAL OPINIONS § • Useful in chronic rheumatism and asthma."<br/>(Surgeon-Major J. M. Houston, Travaucore.)<br/>Fodder.—The LEAVES are said to be eaten by cattle (/?. Thompson).<br/>Structure of the Wood.—Red in the centre, yellowish white in the outer<br/>portion; moderately hard.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | MEDICINE.<br>Leaves<br>Juice.<br>286<br>FODDER.<br>Leaves.<br>287 |
| Hirudo, see Leech, Vol. IV.<br>HOG.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TIMBER.<br>288<br>289                                             |
| Is the name applied to diff <sup>e</sup> r <sup>ent</sup> animals of the family of pigs or Suidae.<br>Besides the numerous dome? <sup>ticated</sup> varieties, India has, according^to<br>derdon, two species of wild A& each representing a different genus. The<br>first of these is the India X/ <sup>M</sup> HoS of BOOAT, Suis Milcus, belonging to the<br>senus Sus linn <sup></sup> representing a different genus. The<br>first of these is the India X/ <sup>M</sup> HoS of BOOAT, Suis Milcus, belonging to the<br>genus PORCULAT *H TO SCA B, y'! A*B described what he believed to be<br>thr*^ now e * ^ ts. £? <sup>on</sup> -ne*, which he found in Tenasserim, Ceylon, and<br>the Andamans. and has d. Sugnated the two last Sus zeylanensis and Sus<br>auuainanensis. As the m * 1 *i r% J * A J * * *'<br>is the c:>e I-A- · , -i together with the domesticated pig, Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ A J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ A J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ A J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ A J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-27 5S L <sup>ndl</sup> CUS ^ A J * thif article. **<br>"M, will heptreated of ^ surparate the domesticated pig. Sus scrofa:<br>"-28 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | ,                                                                 |
| quoted $h_{s}^{g} \wedge o^{n^{o}}$ this: o The $Ho_{S}^{o}$ of all wild animals, causes most<br>iQS sto'the Dear Initor. Though much like the domestic village pig, he<br>affers from ? It Widely in his habits A pure vegetable eater, he is most<br>dainty in his <b>ist</b> , $h^{e} \wedge e^{must have the very best the I and affords, andwhile choosing in daintiest morsels, destnys much more than he eats.Sugarcane is P^{ota}f^{o} \approx a^{n} d other roots, juicy millet, and Indian cornstalks are his effavourite food. A few years ago herds of wild d^{h}_{w} werefound everywhere but twieir numbers are now much smallerfound everywhere but twieir numbers are now much smallerhood, but are po longer so destructive as they were Though compara-tively few are left, herds of fifty and upwards are still occasionally seen."H. 289$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                   |

HOG-TRAGACANTH.

# The Hog.

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|                         | Several varieties of domesticated pig are kept by villagers, when                                                                                                                                                                                                                                                                                                                                               |
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| OIL.<br>Lard.           | religious and caste beliefs permit, in many parts of India.<br>GuiThe fat of the pig, freed from its containing c^''a' ra' 5', e, forms<br>of the valuable commercial product LARD. The best, "}-*a' ra' 5', ky iayers                                                                                                                                                                                          |
| 290                     | by the fat immediately surrounding the kidneys, and by the isy $d$ below the skin. In European trade two other qualities are $F \ll P^* - nd$ and                                                                                                                                                                                                                                                               |
|                         | the softer and more fusible parts of the fat, and are known s^e s^eoaring                                                                                                                                                                                                                                                                                                                                       |
| {                       | third quality lard. Leaf Lard is much used for cooking-and tor $\mathbf{A}$ T J ^ ^ ointments, &c, the second quality is used in the manufacture $\mathbf{u}_{1}$ and $\mathbf{h}_{1}$                                                                                                                                                                                                                          |
|                         | the third is employed as a low grade oil in soap-making, A nis the five $h_{a}$ manufactured by exposing the lard, in woollen bags $h_{a}$ tween to a pressure of about 10 cwt. a square inch in the cold $h_{a}$ to a pressure of about 10 cwt. a square inch in the cold $h_{a}$ to be the square of about 10 cwt.                                                                                            |
|                         | The oleine thus obtained is pure, colourless, and limpid, ana $A_{Of}$                                                                                                                                                                                                                                                                                                                                          |
|                         | about 62 per cent, of the original lard. It is employed as an $f^{\text{TMTMTM}}_{\text{ca}}$ is olive oil in France, and for sperm oil in the Eastern States of Amenrica                                                                                                                                                                                                                                       |
|                         | esteemed as a lubricant, and is said to be used for illuminating.                                                                                                                                                                                                                                                                                                                                               |
| MEDICINE.               | Medidne -Lard, under its classical name of $Ad^*P^*$ or $J^*ty^{*TM}faf$                                                                                                                                                                                                                                                                                                                                        |
| Lard.<br><b>291</b>     | has long held the principal place in medicine as a ${}^{\text{medmm}}J^0J_{00}H_{\text{carlon}}$ it<br>tion of other substances as ointments, &c. As an external principal possesses of itself virtues as an emollient, and is extensively varyout $a_{n}^{\text{ag}}$                                                                                                                                          |
|                         | an inunction in external inflammation, bruises, ${}^{P_{ams}}t_{i}$ . ${}^{e_{ma}}t_{a}$ such as                                                                                                                                                                                                                                                                                                                |
|                         | eruptions, as eczema, erysipelas, and in several ex ant $n \wedge_{e} p \wedge_{scarlatina}$ scarlatina. Recently it has been considerably super seating $J_{Q not turn}$                                                                                                                                                                                                                                       |
|                         | scarlatina. Recently it has been considerably super sead $J_Q$ not turn<br>parations which are not susceptible of deiomposition, and $J_Q$ not turn<br>rancid, such as vasseline. Owing to the rewgious and caste $V$ f, native<br>sections of the people, it has never been employed $***^{en}$ fively amongst a<br>practitioners in India, and it is advisable if<br>mixed community to avoid prescribing it. |
|                         | sections of the people, it has never been employed <sup>e</sup> ** <sup>en</sup> f <sup>vely</sup> amongst a                                                                                                                                                                                                                                                                                                    |
| FOOD.                   | practitioners in India, and it is advisable it $n_{\rm rescale}$ mixed community to avoid prescribing it.                                                                                                                                                                                                                                                                                                       |
| Pork<br>&Lard.          | mixed community to avoid prescribing it.<br>Foo <jthe animal<br="" by="" eaten="" flesh="" is="" mainy="" natives="" of="" pilly="" the="">the Wild Hog being generally preferred, and Viaturally so,-as r seems</jthe>                                                                                                                                                                                         |
| 292                     | is a much cleaner and more careful feeder. Little or no endeavou $\mathbf{o}_{\mathbf{u}}$ is jn $\boldsymbol{\sigma}$ to be made by the natives to improve the condition, as a food pro                                                                                                                                                                                                                        |
|                         | to be made by the natives to improve the condition, as a food pro<br>animal, of the domesticated animal, which is generally allowed to r<br>about and feed wherever it can get anything to c?at. Lard is one <b>ear</b>                                                                                                                                                                                         |
|                         | most extensively used articles in European cookery, and forms a en y substitute for butter.                                                                                                                                                                                                                                                                                                                     |
| DOMESTIC.<br><b>293</b> | Domestic Uses.—The skin forms when tanned a leather which is prin-<br>cipally valued by saddlers. That of the wild boar is much finicker than<br>difficulty in                                                                                                                                                                                                                                                  |
|                         | that of the domesticated animal, and consequently offers more difficulty in<br>the processes of tanning and preparation. Much of the so-called <b>pig skin</b><br>of any preparation of the so-called <b>pig skin</b>                                                                                                                                                                                           |
|                         | of commerce is merely imitation, the skins of other animals ke <sup>m</sup> &. Passed<br>between plates or rollers with a number of projecting points, by wt <sup>iii</sup> L <sup>ine</sup><br>neculiar punctated or dotted appearance of the real skin is imitated rig.                                                                                                                                       |
|                         | peculiar punctated or dotted appearance of the real skin is imitated, rig-<br>skin is chiefly employed by saddlers in covering the seats, $an \wedge \dots = t$                                                                                                                                                                                                                                                 |
|                         | the flaps of saddles, for which, owing to its pliancy and durability, $\pounds \gg $<br>eminently suited. It is also, however, used in the manufacture $d^*$ " j ^                                                                                                                                                                                                                                              |
|                         | small articles of leatherware, such as purses, coverings of pocket DOO ** & c, &c.                                                                                                                                                                                                                                                                                                                              |
|                         | Hog-Deer or Axis porcinus, see article Deer, Vol. 111.1 57*                                                                                                                                                                                                                                                                                                                                                     |
|                         | $\sim [$ vol. $n_{-j}$                                                                                                                                                                                                                                                                                                                                                                                          |
|                         | Hog-gum, see Bassora, Vol. I., 417; also Cochlosperfflfl» <sup>Goss</sup>                                                                                                                                                                                                                                                                                                                                       |
|                         | Hog Tragacanth, Pers., see Pninus Amygdalus, Bailh: VoUV                                                                                                                                                                                                                                                                                                                                                        |
|                         | H. 293                                                                                                                                                                                                                                                                                                                                                                                                          |

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Kurchi or Conessi Baxk. <y. *Murray.*)

# HOLARRHENA, Br., Gen. PL, II, 708.

A genus of trees or shrubs with white flowers, belonging to the Natural Order APOCYNACEJE, comprising seven or eight tropical Asiatic and African species, of which two are allowed, Dy the *Flora of British India*, to belong to India and Ceylon.

## [*Wig hi, Ic.y it. t2gy*<sub>9</sub> 1298; APOCYNACEJE. Holarrttena antidysenterica, *Wall; Fl. Br. Ind., III., 644;*

#### KURCHI OR CONESSI BARK.

Syn.—HOLARRHENA CODAGA, G. Don.; H. PUBESCENS, Wall.; H. MA-LACCENSIS, Wight; ECHIIES ANTI DYSENTERIC A, Roxb.; WRIGHTIA ANTIDYSENTERICA, Grah. / < HONEMORPHA ? ANTIDYSENTERICA, G. Don,</p>

Verŋ.—Kureyd, kaureyd, karvd-indarjou, hat, karra, kaura, kora, kura, kura, kari, karchi, dh&di, (indrajab=seeds), HIND.; Titd-indarjou, kurchi, (indrajab\*\*seeds;, BENG.; Hat, KoL.; Hat, SANTAL; Dudcory, ASSAM; Madmandi, GARO, CACHAR; Indrajao (seeds), kat-bij (bark), kirra, karingi, NEPAL; Dudhali, dudhkuri, MICHI & Samoka, girchi, GOND.; Lisan-ul, as-ufir, inderjan tulkh, indrajab, BEHARI; Kudr, kuer, kura, moriya, N.-W. P.; Kachri, OUDH, KUMAON; Kewar, koeva, kogar, kawar, kura (Bazar seed=indart/au), PB. 5 Karvd-indarjou, pandhra k&ra, dola kura, DEC, BOMB.; Kadú-indra-jou, kudd, MAR.; Kadvoindarjou, kuda, dhowda, hatbaha, hath, Guz.; Kashappu-vetpalarishi, kulap-pdlai-virai(seeds), TAM.; Chedu-kodisha-vittulu, amkudu-vittulu (Moodeen Sheriff), istardku pdla, vistardku pdla (Elliot), amkudu-vittum, palakodsa, TEL.; Beppale, KAN.; Kaipa-kotakap-p&la-vritta, MALAY.; Letonkgyi, letou-kgyi, BURM.; Kutnja, kdlinga, indray ava (asseedsj, SANS.; Lasdnul-aasdfirul-murr, ARAB.; Zabdne-kunjashke-talkh, indar-jave-talkh, tukhme-ahare-talkh, PERS.

ava (asseeds), SANS.; Lasanui-aasajirui-muir, ARAB.; Zabane-kunjashke-talkh, indar-jave-talkh, tukhme-ahare-talkh, PERS.
References.—Brandtš, For. FL, 326, t. 49; Kurs, For. Fl. Burnt., II., 182, 183; Beddome, Fl. Sylv., Anal. Gen., XX., fig. 6; Gamble, Man. Titnb., 263; Dale. & Gibs., Bomb. Fl., 14S; Stewart, Pb PL, 142; Aitchison, Cat. Pb. and Sind PI., 88; Mason, Burm. awi Its People, 4J9, 799; Elliot, Fl. Andhr., 71, 193; Pharm. Ind., 137, 455; Ainslie, Mat. Ind., 1, 88; O'Shaugknessy, Beng. Dispens., S3, 54; Moodeen Sheriff, Supp. Pharm. Ind., 155; U. C. Dutt, Mat. Med. Hind., 192, 300, 307; Dymock, Mat. Med. W. Ind., 2nd Ed., 497; S. Arjun, Bomb. Drugs\* 87 / Murray, PI. and Drugs, Sind, 149; Irvine, Mat. Med., Patna, 40, 50, 62; Med. Top., Ajmir, 138; Flemings, Med. PI. & Drugs, in As. Res., XI., 166; K. L. Dey, Indig. Drugs., Bengal, 123; Atkinson, Him. Dist., 3\*3, 739 i Drury, U. PI, 24\$: Lisboa, U. PL Bomb., 101; Bird wood, Bomb. Pr., 54; Christy, Com. PL and Drugs, IV., 27; V, 72; VI, 96; Indian Forester, III., 203; IV., 228; X., 325, XIII., 121; XIV., in; Ind. Agric, Aug. 24th, 1886; Kew Off. Guide to the Mus. of Ec. Bot., 96; Forest Ad. Rep. Ch. Nagpore, 1885, 32; Rep. by Conservator of Forests, S. Circle, Madras; Gazetteers 1—Bombay, XV., 438; Orissa, If., 159, 'Sit App.IV.j N.-W. P., I., 82; IV., Ixxiv; District Manual, Trichinopoly, 80; Settlement Reports, Kdngra, 22; Cent. Prov., 39.

**Habitat.**—A small deciduous tree, with a pale bark, native of the Tropical Himalaya, from the Chenab westwards, ascending to 3,500 feet, extending throughout the dry forests of India to Travancore and Malacca. Great confusion existed for years as to the identity of this plant, and in India the drug was adulterated with, or mistaken for that obtained from a species of Wrightia, a plant medicinally inert. For this reason the very valuable medicinal bark and seeds have fallen into undeserved disrepute. In the *Pharmacopceia of India*, p 455, an interesting account by Wight of the origin of this confusion between Wrightia and Holarrhena, will be found. From this it appears that the mistake was originally due to Linnaeus who, in preparing his *Flora Zeylanica*, found a specimen of what was then known as Nerium indicum siliquis angustis, in Herman's Herbarium. To that plant he subjoined^as a synonym Rheede's **Codagapala**, a continental and widely different plant, reported even at that

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HOLARRHENA

antidvsenterica

## HOLARRHENA

antidysenterica.

Kurchi or Conessi Bark.

early time to be possessed of great medicinal virtues as a remedy in dysentery. On the strength of this report he named the double, or spurious, species, Nerium antidysentericum.

This formation of one species from types of two different genera was not corrected till Brown in 1809 published his revision of the APOCYNACEA. Herman's Ceylon species was then assigned to the new genus Wrightia, under the name of W. zeylanica, 2?r., and Rheede's Malabar plant fell in \* o another new genus, Holarrhena becoming H. antidysenterica. About the same time Roxburgh, while writing his Flora Indie a, prepared drawings of three Apocynous trees, one Nerium tinctorium, Roxb., which Brown referred to Wrightia, another of Echites antidysenterica, the Codagapalaof Rheede, and the Holarrhena of Brown and the third, Alstonia, which Roxburgh also placed in Echites. In his description of these species he commented on the confusion between these plants, and expressed it as his opinion that the bark of the Nerium (Wrightia) tinctorium was gathered and sold as Conessi bark, and thus had given rise to the disrepute into which that medicine had even then fallen. The distinction between Holarrhena antidysenterica and Wrightia tiuctoria, tomentosa and zevlanica has thus been made for nearly 100 years, yet notwithstanding this fact confusion has always existed between them, and still exists in the works of certain Indian writers, the species of Wrightria being accepted as identical with Holarrhena. To the native drug-collectors these plants are, however, quite distinct, the bark of W. tinctoria being professedly the chief adulterant of Conessi. As the error here indicated is one seriously affecting the reputation of the true drug, and contracting the extent of its employment, the following short account of the distinctive characters of the two genera, may be given 1—

## WRIGHTIA.

- (0 Corolla not more than twice tVe length of the calyx, mouth surrounded by a corona or teeth.
- (2) Stamens inserted within the mouth of the corolla, anthers protruding, twisted and surrounded by the corona.
- (3) Seeds straight, oblong, compressed with a coma of h-'.irs at the base, the apex being pointed and naked.

### HOLARRHENA.

- (1) Corolla three or four times the length of the calyx; moutl. naked.
- (2) *Stamens* inserted at the bottom of the tube and therefore not protruding.
- (3) Seeds linear, oblong, compressed, concave, with a coma of hairs on the apex.

Dr. Dymock, alluding to the confusion of Wrightia with Holarrhena, remarks that the barks may be distinguished pharmaceutically; the stembark of Holarrhena, he says, is thick and dirty white or buff coloured, its root bark reddish-brown and nearly smooth; the stem-bark of Wrightia is reddish-brown, and nearly smooth, the root dark brown or nearly black, and both afe less bitter than those of Holarrhena.

In Alstonia, a genus which has also been confuted with the preceding, the seeds are attached to the fruit in the middle, and have a coma of hairs at both extremities.

Oil.—The SEEDS yield about 30 per cent, of a fixed oil, of a greenish yellow colour and having a peculiar odour, but bland to the taste. The Revd. A. Campbell mentions this seed oil as being used medicinally by the Santals

Dye—"The wood ash is used in dyeing in Chutia Nagpore" (Revd. A. Campbell),

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OIL. Seeds. **295** 

> DYE. 296

**HOLARRHENA** 

antidysenterica.

| Indrajau | or | Indrajava | Seeds. | ( <b>J</b> . | Murray). |
|----------|----|-----------|--------|--------------|----------|
|----------|----|-----------|--------|--------------|----------|

MEDICINE. Bark. Medicine.—The BARK both of the stem and root and the SEEDS are amongst the most important medicines of the Hindu Materia Medica, the **207** Seeds. former being considered a powerful antidysenteric, while the latter have ascribed to them astringent, febrifuge, antidysenteric, and anthelmintic 298 properties. By Arabian and Persian writers the seeds are considered carminative and astringent, valuable in pulmonary affections, tonic, lithontriptic, and aphrodisiac. Both seeds and bark enjoyed at one time a European reputation, but probably owing to confusion with, or adulteration by, the cheaper and comparatively inert species of Wrightia, they are now almost entirely neglected. The Pharmacopeia of India classes Holarrhena amongst the non-officinal drugs, but reports favourably on its therapeutic qualities; indeed, Indian writers on therapeutics and materia medica, generally, are. unanimous in recommending the drug. U. C. Dutt, in his Hindu materia Medica, gives the principal methods of prescription followed by the Hindus and Sanskrit writers, from which it appears that a fluid extract, an expressed juice, a compound decoction and confection are prepared from the bark; from the seeds a compound powder and a fermented liquor. An oil for external application is also made by mixing a decoction of the bark, a number of astringent and aromatic substances in small quantities, and sesamum oil. The Revd. A. Campbell, in his Econo\* mic Products of Chutia Nagpore, writes: "The bark, dried and ground, is rubbed over the body in dropsy. The fruit is applied in snake-bite to allay swelling and irritation, and the seeds yield a medicinal oil." Mr. U. C. Dutt prefers for administration a watery extract of the root-bark, in doses of about three grains in combination with half a grain of opium. Dr. Dymock mentions that the root-bark alone is employed by the natives of the Goa territory and the Konkan. This selection of the root-bark as the most powerful antidysenteric part of the plant appears to be confirmed by several of the special opinions quoted hereafter. The Indian Medical Gazette, 1886, Vol. /.,  $j_0 j_t$  states that during the cattle plague epidemic at Backergunge the seeds were extensively employed, being supposed to possess certain specific virtues, but\* the results are not given. As both the bark and seeds contain a basic substance (Wrightine or Conessine), which seems to be the important therapeutic constituent, it appears desirable that a careful quantitative analysis of the different medicinal parts of the plant should be made, so that it might be finally decided which is the most valuable. Such an analysis might result in the discovery of a cheap method of separation of an antidysenteric, and possibly antipyretic and antiperiodic alkaloid of very considerable value. Dr. Warden. in a short account of the qualitative analysis of the barks and seeds, writes that a solution containing the partly purified alkaloid has been used with success in the treatment of fevers and dysentery. Should it, even in a smaller degree, possess the specific properties of Quinine and Ipecacuanha a most valuable drug would be added to our remedies for tropical diseases.

SPECIAL OPINIONS.—§ " Is a very useful medicine in chronic dysentery. In acute cases is not to be compared with ipecacuanha. Assistant Su-geon Moti Lall Mukerjee (of the hospital here), who uses it largely, tells me that the powder is a more useful preparation than any other, Dose 10 to 20 grains three times daily in a little water for an adult" (Surgeon-Major E. Sanders, Chittagong). "Juse the decoction in chronic dysentery with excellent results" (Surgeon R, l. Dutt, M.D., Pubna). "Useful in chronic dysentery and diarrhoea" (Surgeon-Major E. E. Bensley, Rajshahye). "In fourteen consecutive<sub>ca</sub>ses of dysentery in the jail hospital I have used the decoction of the bark y; th success. The average period of treatment was five days. Ipecacuanha; was given in no case"(CYvt7 Surgeon D. Basu, Faridpore, Bengal). "I have used this drug wuh great

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## HOLARRHENA

### Kurchi or Conessi Bark.

antidysenterica. advantage in dysentery among prisoners " (Surgeon R. D. Murray, M.D., Bur dm an). " Decoction of bark is very valuable in dysentery " (Bolly Chunder Sen, Teacher of Medicine). " The bark of H. antidysenterica called kurchi is useful in dysentery, given as an infusion in doses of MEDICINE. from I to 2 ounces " (Surgeon E. S. Brander, M.B., F.R.C.S.Edin., Rungpore). "Kcorchee bark is used in cases of dysentery; it may be administered together with opium, ipecac, tannic acid, &c." {Surgeon J. Ffrench Mullen, M.D., Saidpore). "Almost a specific in chronic dysentery even if there be sloughing of the mucous membrane. The decoction is useful in cases of piles, bleeding, or otherwise. The seeds are given in the acute stage of dysentery whether accompanied or not by fever " (W. Forsyth, F.R.C.S., Edin., Civil Medical Officer, Din\_aj pore). "Have used the decoction of the bark largely in dysentery after the acute stage with satisfactory results; also in chronic diarrhoea "(Surgeon C. H. Joubert, Darjeeling). "I seldom use ipecacuanha in dysentery in my practice now. If the decoction of the bark be used in acute dysentery it should be given in 2 oz. doses with a little opium every two hours or so. But the alkaloid *Kurchiene* is very efficacious in the acute stage of dysentery " (Surgeon K. D. Ghose, Bankura, Bengal). " There is nothing to remark, in addition to what has already been noted, regarding this useful remedy except to point out that in a heemorrhagic, sub-acute, and chronic dysentery, it should be prescribed. In ordinary acute inflammatory dysentery this remedy should not be employed; kurchi, in common with every other active astringent, should be avoided in the early stages of the disease. The indiscriminate use of this drug in every stage of dysentery and diarrhcea has, in my opinion, led many practitioners, both European and Native, to doubt the efficacy of this medicine. It is a most useful remedy when prescribed with judgment" (Civil Surgeon R. G. Mat hew, Mozuffer\* pore). "Used in chronic rheumatism " (Surgeon-Major J. J. L. Ration, M.D., Salem). "The seeds in dose: of I to 2 grains are useful in the diarrhcea of young infants, and as a tonic in cases of emaciation and general debility in doses of 4 to 5 grains. A combination of the seeds, old cotton, and honey is used by the natives as a local application to the os uteri in cases of inflammation of the uterus " (*First Class Hospital As-sistant Lai Mahomed, Hoshangabad, Central Provinces*). " 1 can also bear testimony to the effects of this remedy in dysentery, especially in children" (Surgeon-Major P. N. Mookerjee, Cuttack, Orissa). "The decoction of the bark is very useful in acute and sub-acute dysentery. In chronic cases, however, I found it fail, in two instances, like other medicines. The bark must be used fresh from the tree " (Assistant Surgeon Shib Chunder Bhattacharji, Chanda, Central Provinces). \*\* I can with great confidence add my testimony to the value of this remedy in dysentery. I use a decoction of the bark with or without Ipecac.: and I have always found the result most satisfactory. It is specially useful in acute cases after large doses of ipecac, given in the early stage of the disease and is largely used in charitable dispensaries and hospitals" (Civil Surgeon S\* M. Shircore, Moor she dabad). "The decoction in 1 ounce doses, as well as the fluid extract of the bark of the root, in doses of 10 to chronic ·'' (Assisia Lii,  $^{rf}$  (!<sup>uent</sup> y <sup>usec</sup>\*\*<sup>n</sup> dysentery, haemorrhagic as well as employed the decoction. 'i'S<sup>eon</sup> Nundo Lai Ghose, Bankipore.) '' Have good results<sup>M</sup> (Surgeon **G**.  $^{e}$  the bark in ounce doses in dysentery with very TRADE. Trade.—Dr. Dymo«s <sup>^</sup> *Peachy, Purneah*). both articles of local co <sup>ck states of</sup> Bombay : "The bark and seeds are seeds R25 per maund oi'<sup>mmerce</sup>- Value, bark Ri£ per maund of 37Jib; 200 FODDÉR. Leaves.

300

Fodder.—In the Pa? 37 p."

 $H_{t 300}$ 

ijab the LEAVES appear to be used as fodder (or

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| ji                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LIGARNA                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| A Cevion Holarrnena. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                  | nottiana.                                       |
| litter)? (Stewart). The Conservator of Forests, Panjáb, confirms this<br>fact, writing that it is a fodder tree in the Kángra District.<br>Structure of the Wood.—White, soft, even-grained, weight about 40ft<br>per cubic foot. It is largely used for carvings, especially &t Saharanpur<br>and Dehra Dún; in Assam for furniture; in South India for turning.<br>Ham?'ton mentions that beads made of the wood are worn round the neck<br>in Assam as a charm. | TIM<br>301                                      |
| Holarrhena mitis, Br.; FL Br. Ind., UI. 645.                                                                                                                                                                                                                                                                                                                                                                                                                       | 302                                             |
| Vern.—Kirvmalla, kirri-walla-gass, SING.<br>References.—Beddome, Fl. Sylv., Anal. Gen., 161/Gamble, Man. Timb.,<br>^263; Thwaites, En. Ceylon PI., 194; Balfour, Cyclops II., 93.<br>•labitat.—A medium-sized tree, found not uncommonly in Ceylon up<br>to .,500 feet.                                                                                                                                                                                            | 302                                             |
| Structure of the Wood.—White, close-grained, soft, in structure resembling that of H. antidysenterica. Weight about 35ft per cubic foot. It is employed in Ceylon for fine wood-work, especially for inlaying.                                                                                                                                                                                                                                                     | TIMBER.,<br>303                                 |
| HOLBCELLIA, Wall.; Gen. PL, I., 42.                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |
| Holbcellia latifolia, Wall; Fl. Br. Ind., /., 108; BERBBRIDE*.<br>Var. 1, latifolia.                                                                                                                                                                                                                                                                                                                                                                               | 304                                             |
| Syn.—H. ACUMINATA, <i>LindU;</i> STAUNTONIA LATIFOLIA, <i>Wall</i> .                                                                                                                                                                                                                                                                                                                                                                                               | ł                                               |
| Var. 2, angustifolia.<br>Syn.—H. ANGUSTIFOLIA, Wall.; STAUNTONIA ANGUSTIFOLIA, Wall.<br>Vern.—Bagul, NEPAL; Pronchadik, LEPCHA; Domhyem, BHUTIA; Gophla,<br>KUMAON.                                                                                                                                                                                                                                                                                                |                                                 |
| References.—Atkinson, Him. Dist., 304; Treasury of Bot., I., 594'<br>Habitat.—A climber found in the Himalaya, altitude 4,000 to 9,000<br>feet, from Kumaon eastward to Bhutan, also in the Khdsia Hills; and in<br>Upper Assam at low elevations.<br>Food.—Produces a large, edible FRUIT.                                                                                                                                                                        | FOOD.                                           |
| Holcus Sorghum, Linn.                                                                                                                                                                                                                                                                                                                                                                                                                                              | Fruit.                                          |
| THE GREATER MILLET, or Juar, see Sorghum vulgare, Pers.                                                                                                                                                                                                                                                                                                                                                                                                            | 305                                             |
| HOLIGARNA, Ham.; Gen. PL, /., 42\$.                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |
| A genus of lofty trees belonging to the ANACARDIACEJE, and comprising<br>seven species, all Indian.                                                                                                                                                                                                                                                                                                                                                                | 500                                             |
| Holigarna Arnottiana, Hook. /.,> Fl. Br. Ind., II., 36; ANACAR-                                                                                                                                                                                                                                                                                                                                                                                                    | soe                                             |
| <ul> <li>Syn.—HOLIGARNA LONGIFOLIA, Wt. &amp; Am.</li> <li>Vern.—Bibu, hulgeri, BOMB.; Holgeri, MAR.; Kagira, hutugeri, KAN.</li> <li>References.—Beddome, Fl.Sylv., t. 167; Gamble, Man. Timb., 112/<br/>Dals.&amp; Gibs., Bomb. Fl., 51; Graham, Cat. Bomb. PL, 41; Lisboa,<br/>U. Pi. Bomb., 55, 250.</li> </ul>                                                                                                                                                |                                                 |
| Habitat.—A tree with stout branches, of the Western Gha*ts, from the Konkan southwards.                                                                                                                                                                                                                                                                                                                                                                            |                                                 |
| Oleo-resin.—Beddome states that "a very acrid black juice is obtained frpm the trunk and fruit rind, which is used by painters, and as a black                                                                                                                                                                                                                                                                                                                     | OLEO-<br>RESIN,                                 |
| varnish."<br>Medicine.—The FRUIT and BARK are employed medicinally ( <i>Beddome j</i><br><i>Lisboa</i> ). No information regarding their actual therapeutic properties is,<br>however, obtainable.                                                                                                                                                                                                                                                                 | <b>307</b><br>MEDICINE.<br>Fruit.<br><b>308</b> |
| Structure of the Wood.—The tree is given by Lisboa in his <i>List of</i><br><i>Timber Trees.</i> He writes : "Wood grey or yellowish-brown, close-grained,<br>but soft. It is stated that in some parts it is used for house and boat-<br>building." Beddome writes that he has never seen it used, but has heard<br>that it is employed for similar purposes.                                                                                                     | Bark.<br><b>300</b><br>TIMBER.<br>310           |
| $\frac{l^2}{l^2}$ H. 310                                                                                                                                                                                                                                                                                                                                                                                                                                           | •                                               |

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| IOLMSKIO<br><u>sanguin</u>  | Holigarna Varnish.                                                                                                                                                                                                                                |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 311                         | Holigarna Grahamii, Hook./, (not ofKurz); Fl. Br. Ind., //., 37                                                                                                                                                                                   |
|                             | [ Wight, Ic, t. 2js ; IU-> '• <sup>rS</sup> .                                                                                                                                                                                                     |
|                             | Syn.—SEMECARPUS GRAHAMII/ Wt.                                                                                                                                                                                                                     |
|                             | <ul> <li>References.—Gamble, Man. Timb., 112; Dale. &amp; Gibs., Bomb. FL, 5<br/>Lisboa, U. PL Bomb., SS; Bombay Gazetteer, XV. (Kandra), 43i.</li> <li>Habitat.—A tree 20 to 30 feet in height (80 to 100, Kandra Gaeettee)</li> </ul>           |
| LEO-RESIN.                  | /. cit.), found in parts of the Western Peninsula.                                                                                                                                                                                                |
| 312<br>TIMBER.              | Oleo-resin.—The trunk and fruit-rinds yield a black viscid juice simil<br>in properties to that obtained from H. Arnottiana.                                                                                                                      |
| 313                         | Structure of the Wood.—Although Lisboa mentions this in his list                                                                                                                                                                                  |
| 3X4                         | timber trees, he says that its wood is not known to be of any value.<br>H. Helferi, <i>Hook. // Fl. Br. Ind., II., 37.</i>                                                                                                                        |
| 0111                        | <b>Reference.</b> — <i>Kurg, For. Fl. Burm., 315.</i>                                                                                                                                                                                             |
|                             | Habitat.—A tree with robust branchlets, frequent in the tropical fore                                                                                                                                                                             |
| DLEO-RESIN.                 | of Martaban, Tenasserim, and the Pegu Yomah.<br>Oleo-resin.—" It yields a black varnish " ( <i>Kurg</i> ).                                                                                                                                        |
| <b>315</b><br>TIMBER.       | Structure of the Wood—" Heavy, brown, soft, close-grained, perishab<br>and soon attacked by xylophages." ( <i>Kurg</i> ).                                                                                                                         |
| 316<br>317                  | H. longifolia, Roxb.; FL Br. Ind., II., 37.                                                                                                                                                                                                       |
| 517                         | Vern.—Barola, BENG. ; HMugiri, hulagiri, BOMB. % Sudra bibo, MAR                                                                                                                                                                                  |
|                             | Hole ger, KAN.; Khreik, MAGH.J She-che, BURM.                                                                                                                                                                                                     |
|                             | <b>References.</b> — <i>Roxb., Fl. Ind., Ed. C.B.C., 267; Kurst, For. Fl. Bur. 3iS; Gamble, Man. Timb., 112; Mason, Burma and Its People, 5</i>                                                                                                   |
|                             | 3iS; Gamble, Man. Timb., 112; Mason, Burma and Its People, 5<br>Drury, U. PL, 246; Liotard, Dyes, app. ix.; Watson, Report on Gui<br>22, 32; Balfour', Cyclop., II., ~g3} freeasury of Bot., I", S94; Bui<br>Gas., I., 134; Bombay Gag., XV., ?/• |
|                             | Gas., 1., 134; Bombay Gag., XV., ?/•                                                                                                                                                                                                              |
|                             | Habitat.—A tall tree, native of Eastern Bengal, Chittagong, and Pea<br>The Bombay form seems most probably to be H. Arnottiana, <i>Hook.f.</i>                                                                                                    |
| GUM-RESIN.                  | Gum-resin A resinous highly acrid and poisonous juice is obtain                                                                                                                                                                                   |
| 318                         | from the trunk and fruit-rind which on drying forms the well-known bla<br>lacquer varnish. Mason states that it is used by the natives of Bur                                                                                                     |
|                             | to varnish shields, and for other similar purposes. The prepared juice                                                                                                                                                                            |
| MEDICINE.                   | imported from Manipur to be employed for lacquer-work.<br>Medicine.—Morton states that the FRUIT and BARK are employed me                                                                                                                         |
| Fruit.                      | cinally, but require to be prescribed with caution, as they are apt to give i                                                                                                                                                                     |
| <b>319</b><br>Bar! <b>4</b> | to dangerous symptoms. He makes no mention, however, of their the                                                                                                                                                                                 |
| 320                         | peutic properties, nor does further information regarding this appear to available.                                                                                                                                                               |
| TIMBER.                     | Structure of the Wood.—Grey with yellowish streaks, soft. Balfe                                                                                                                                                                                   |
| 321                         | mentions it as being employed for house-building and making beams, we<br>Drury states that it is used for making small boats. Other authors rega                                                                                                  |
|                             | it as useless.                                                                                                                                                                                                                                    |
|                             | Holly, see Ilex, p. 327.                                                                                                                                                                                                                          |
|                             | Hollyhock, see Althaea rosea, Vol. I., p. 200. 0                                                                                                                                                                                                  |
|                             | HOLMSKIOLDIA, Retz.j Gen. PI, II., nj6.                                                                                                                                                                                                           |
| 000                         | [VERBENAC                                                                                                                                                                                                                                         |
| 322                         | Holmskioldia sanguinea, Ret*.; Fl. Br. Ind., IV.,596;                                                                                                                                                                                             |
|                             | Syn.—HOLMSKIOLDIA RUBRA, <i>Pers.;</i> HASTINGIA COCCINEA, <i>Smith;</i><br>SCAN DENS, <i>Roxb.</i> ; PLATUNIUM RUBRUM, <i>JUSS.</i>                                                                                                              |
|                             | <i>em.—Kul tolia</i> , KUMAON.                                                                                                                                                                                                                    |
|                             | References.—/?^., /r/. ind., Ed. C.B.C., 480; Brand., For. Fl.,3<br>Kurz, For. FL Burm., II., 257.                                                                                                                                                |
|                             | H. 322                                                                                                                                                                                                                                            |
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| I DE ENDRE-JEAVED EUM. (J. WURRAY.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | OSTEMMA<br>needei.                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Habitat.—A straggling shrub of the Sub-Tropical Himálaya from Kuma-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <u>ictuți.</u>                                          |
| on to Bhotan, ascending to an altitude of 4,000 feet; found also in the<br>Prome Hills.<br>Fodder.—See Vol. HI., 429.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 323                                                     |
| HOLOPTELEA, Planch.; Gen. PL, III., 352.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 525                                                     |
| Holoptelea integrifolia, Planch.; Fl. Br. Ind., V.,481; Wight, lc9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 324                                                     |
| <ul> <li>[/. 1968; URTICACKE.</li> <li>THE ENTIRE-LEAVED ELM.</li> <li>Syn.—ULMUS INTEGRIFOLIA. Roxb.</li> <li>Vern.—Papri, dhamna, ktinj, karanji, chilbil, chilmil, kůmba, kůnja nôli, kandru, begana, HIND.; Karinji, GoND; Karanjel, KURKU; Papart kanju, KUMAON; Pdpri, kkulen, arjdn, radian, kachdm, PB.; Chill a, BANDA; Wawali, MAR.; Aya, tarn bach-marum, TAM.; Namli, navili, nali,pedda-nowlieragu, TEL.; Rasbija, KAN.; Thapsi, MYSORE,CooRG; Kalddri, HASSAN; Myaukseit, BURM.; Dadahirilla, SING.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C.,263; Brandts, For. Fl., 431 * Kurz, For. Fl., Burm., II., £j3; Beddome, Fl. Sylv., t. 3/0; Gamble, Man. Timb., 342; Dale. &amp; Gibs., Bomb., 'Fl., 238; GraftCat.«Bomb., FL, 644-</li> <li>Habitat.—A large, spreading, deciduous tree, met with on the outer lower ranges of the Himálaya from Jamu to Oudh, ascending to 2,000 feet; also from Banda and Behar to Travancore, and from Pegu to Martaban. It is often planted in North and Central India, and prefers a dry, sandy or shingly soil.</li> <li>Oil.—"An oil is expressed from the SEED in the Melghat" (Gamble). Fodder.— See Vol. III., 414.</li> <li>Structure of the Wood.—Light, yellowish grey, moderately hard, no heartwood. Employed for building purposes, cart making, tire.; also for fuel and for making charcoal.</li> </ul> | OIL<br>Seed.<br>325<br>FODDER.<br>326<br>TIMBER.<br>327 |
| <b>HOLOSTEMMA, Br.</b> ; Gen. PL, IL, 760.<br><i>u</i> . A small genus of the ASCLEPIADE*:, consisting of twining glabrous shrubs, with large purple flowers. There is only one Indian species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                         |
| [597; AsCLEPIADE-ffi-<br>Holostemma Rheadei, Wall.; FIL B. Ind., IV., 21; Wight, Ic, t-<br>S yn. HOLOSTEMMA FRAGRANS. Wall.; H. BRUNONIANUM, Royle; H-<br>ADAKODIEN, Roem & Sch.; ASCLEPIAS ANNULARIS, Roxb.; SACROSTEM<br>MA ANNULARE, Roth.; GOMPHOCARPUS VOLUBILIS, Herb. Ham.<br>Vern.—Ap&ng, KOL.; Apting, morou raak (Rev. A. Campbell),<br>SANTAL; Tultuli, sidori, dudurli, BOMB.; Tulatule, sidodi, MAR.; Palay<br>kirai, TAM.; Pala kura pdla gurugu, istara kula, TEL.; Ada modien,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 328                                                     |
| ada kodien, MALAY.<br>References.— Roxb., Fl. Ind., Ed. C.B.C., 253; Dals. & Gibs., Bomb. Fl.,<br>148; Graha <sup>m</sup> , Cat. Bom. Pl., 121; Rheede, Hort. Mal., IX., t. 7;<br>Campbell, Cat. He. frod., UHutia JMagpur, JXO. 7573; ninov, w. nnanr.'<br>> 142; Dymock, Mat. Med. W. Ind., 2nd Ed., 5*5/ \$• Arjun, Bomb'<br>Drugs, 200; Drury> U. Pl., 246; Lisboa, U. PI. Bomb., 165, 233; Royle'<br>III. Him. Bot.y 276, t. 66; Royle, Fib. Pl., 306; Indian Forester, III.,<br>237; Bal/our, Cyclop., II., 96; Treasury of Bot., I., 594; Gazetteers.—<br>Mysore and Coorg, I., 56; Bombay, XV., J38; NW. P., IV., Ixxiv.<br>Habitat.—An extensive climber, met with in the forests of the Tropical<br>Himalaya from Sirmore to Sikkim at altitudes of from 3,000 to 5,000 feet!<br>also in the Deccan Peninsula from the Circars and Kanara southwards'<br>and in Pegu and Burma.<br>Fibre.—The PLANT yields a fibre about which very little information i <sup>8</sup><br>available. Lisboa, however, describes it as fine and silky and adapted<br>. H, 329                                                                                                                                                                                                                                                                                                       | FIBRE.<br>Plant.<br><b>329</b>                          |

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| HOMALIUM                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>zeylanicum</u>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MEDICINE.<br>Root.<br>330             | for cordage and paper-making. Royle states that it attains its best con-<br>dition after the rains.<br>Medicine.—R heede first drew attention to the medicinal virtues of the<br>ROOT, mentioning its value as an application for ophthalmia and<br>"dimness of vision * (presumably that form due to keratitis). Dymock<br>writes regarding its utilisation in Western India : <sup>ts</sup> The roots areaised as<br>a remedy for scalding in gonorrhoea, and, beaten into a paste, are applied to<br>the eyes in ophthalmia. In diabetes, the root rubbed to a paste, is given in<br>cold milk. In spermatorrhoea the dried root, with an equal quantity ot<br>the root of Eriodendron anfractuosum powdered, is given in 6-massa doses,<br>with milk and sugar, twice daily." The Revd. A. Campbell describes it<br>as employed in decoction by the Santals, as a remedy for cough, an* also<br>for orchitis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| FOOD AND<br>FODDER.<br>Leaves,<br>331 | Food and Fodder.—The LEAVES and FLOWERS are eaten as a vege-<br>table in parts of Bombay. Campbell mentions that the leaves are similarly<br>employed in Chutia Nagpur, and that cattle eat the plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Flowers.                              | HOMALIUM, Jacq. ; Gen. PL, /., 800.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 332                                   | A genus of the SAMYDACE^E, of shrubs or trees, which comprises 30 species,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                       | scattered over the tropical regions of nearly the whole globe. Of these, u <sup>or</sup> 12 are Indian.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                       | Homalium tomentosum, <i>Bth.; Fl. Br. Ind., II</i> , 5g6; SAMYDACEE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 333<br>•<br>TIMBER.<br>334            | <ul> <li>Syn.—BLACKWELLIATOMENTOSA, Vent. / Brandis, Burma Catalogue, 186<br/>No. 58; B. SPIRALIS, Wall., Cat., 4897, partly.</li> <li>Vern.—Myaukchyaw, BURM.</li> <li>References.—Brandis, For. Fl., 243; Kure, For. Fl. Burm., U Sfr;<br/>Gamble, Man. Timb., 207; Indian Forester, XII., 73; Balfour, Cyclop*,<br/>II., 96; Burm. Gaz., I., i30.</li> <li>Habitft.—A large deciduous tree of Chittagong and Burma, growing to<br/>a height of 80 to 00 feet, with a clean stem of from 40 to 50, ana'a<br/>girth of from 8 to 10 feet. The bark is fine-grained, of a pale greyisn-<br/>green colour, and marststie and "with dark-coloured HeartWood, very<br/>Structure of the Wood.—" Brown, with dark-coloured HeartWood, very<br/>Structure of the Wood.—" Brown, with dark-coloured HeartWood, very<br/>structure of the Wood.—" Brown, with dark-coloured HeartWood, very<br/>colour, and close-grained; splits in seasoning" (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning" (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>hard, heavy, and close-grained; splits in seasoning " (Gamble). "Light<br/>polish, and is said to be employed for mating TM<sup>e</sup> Romanis, the Chemi-<br/>be particularly adapted for furn.tur/rnafang? .Dr (Romanis, the Chemi-<br/>be particularly adapted for</li></ul> |
| 335                                   | <ul> <li>of lime.</li> <li>H. zeylanicum, Benth.; Fl. Br. / ^ // TRANDRA, WLilc.tt. is*.<br/>SynBLACKWELLIAZEYLANICA, Gardn. ,*B. TETRANDRA, KK*, ,<br/>Vern.—Liang, SING.<br/>RefereacesZ?«fcfo«*, Fl. Sylv., 2ioj Gamhb<sup>T</sup>. ***, <sup>J</sup>-fijii**<br/>Thwaitcs, En. Ctylon Pl.,79,4'0; Tnmen, Cal. W<sup>-1</sup>-&gt; "'<br/>Habur PHB/M D'T T'T'T'T' Cigh ^ not'uncommon in the<br/>of C+ SIK SiCJRS*=**h Thwaite, and Beddome describe the</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TIMBER.<br><b>336</b>                 | as very strong and valuable for building purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 550                                   | H. 336                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Honey and Bees'-Wax. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | HONEY.                 |
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| Hominy meal, see Zea Mays, Linn.; GRAMINE.«                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | •                      |
| <ul> <li>HOMALONEMA, Schott, Gen. PL, III., 983.</li> <li>A genus of robust herbs belonging to the AROIDE.*, which comprises about 20 species, natives of Tropical Asia and America. Of those indigenous to India, only one is of economic value. Schott and also Englergive the genus as HOMALOMENA, but the Genera Plantarum adopts the form here given, vie., HOMALONEMA. [nerOm //., JJJ; Wight., Ic, t. 80\$/ AROIDEE.</li> <li>HOMALONEMA aromaticum, Schott; Engler, in DC. Monog. Pha-Syn.—CALLA AROMATICA, Roxb., Fl. Jnd., Ed. C.B.C., 630.</li> <li>V*xn.—Kuchu gundubi, BENG.</li> <li>References O'Shaughnessy, Beng. Disk ens., 625; Drury, U. PL, 247; Balfour, Cyclop., II., 97; Treasury of Bot., I, 595.</li> <li>Habitat.—A herb which when cut diffuses a pleasant aromatic scent;</li> </ul> | 337                    |
| indigenous to Chittagong.<br>MedicineThe large RHIZOME, which is invested with the old withered<br>leaf-scales, bears numerous white, long rootlets issuing from its surface, and<br>is said to be held in high estimation by the natives as an aromatic stimulant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MEDICINE.<br>Rhizomes. |
| HOMONOIA, Lour.; Gen. PL, III., 322.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| A genus of rigid shrubs belonging to the EUPHORBIACE <sup>A</sup> :, comprising<br>two Indian species. [1808; EuPHORBIACEJE.<br>Homonoia riparia, Lour.; Fl. Br. Ind., V., 4\$5; Wight, Ic, t.<br>Syn.—ADELIA NERIIFOLIA, Roth.; RICINUS SALICINUS, Hassk.; SPA-<br>THIOSTBMON SALICINUS, HttSik.; S. JAVENSE, Blume. / HEMATOSPER-<br>MUM SALICINUM, Baill.; H. NERIIFOLIUM and RIPARIUM, Wall.; CRO-<br>TONSALICINUM, Baill.; G. 14                                                                                                                                                                                                                                                                                                                                                                             | 339                    |
| <ul> <li>TONSALICILIFOLIUS, Geisel.</li> <li>Vein.—Khola ruis, NEPAL; Mongthel, LEPCHA; Kat-alluri, MAL. (S.P. X. Sundeh, GOND.; Kanddgar, KUMAON; Jeljambu, KURKU; Taniki, TEL.; Momaka, yae-ta-kyee, yae-ta-gyiben, BURM.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 744; Brandis, For. Fl, 445, Kur%, For. FL Burm., II., 401; Beddome, Fl. Sylv., t. 212; Gamble, Man. Timb., Z64; Thwaites, En. Ceylon PL, 273; Dale. &amp; Gibs., Bomb. FL, 23r; Gradh., Cat. Bomb. PL, 185; Trimen, Cat. Cey. PL, 82: Atkinson, Him. Dist., 3i7; Indian Forester, III., 204; Gazetteers:— Bombay, XV., 443; NW. P., IV., Ixxvii.</li> </ul>                                                                                                                                                                         |                        |
| Habitat.—A small rigid evergreen shrub, found on the rocky and stony river-beds of the Sikkim Himalaya at an altitude of 1,000 to 2,000 feet; also in Assam, the Khasia Hills, and southward to Burma, Tenasserim, the Andaman Islands, and Bundelkhund, and in the Deccan Peninsula from the Konkan southward. It is also common in Ceylon up to an elevation of 2,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Structure of the Wood.—Grey or greyish brown, moderately hard, close-grained. Weight 40^ per cubic foot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | TIMBER.                |
| HONEY AND BEES'-WAX.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 341                    |
| <b>.Honey</b> is the saccharine substance obtained from the honeycomb of <b>Apis</b> mellifica and other species of bees, for an enumeration of which the reader is referred to the article " <b>Bees</b> ," Vol. I., p. 434. The saccharine matter is gathered by the bees from the nectaries of many species of flowers and is sucked into the crop, where it undergoes certain chemical changes, the cane sugar or saccharose of the nectar being converted into " invert" sugar, a compound of dextrose and laevulose. According to certain chemists, this conversion of cane sugar is complete, leaving none in the prepared honey, while others contend that cane sugar is always present. This difference of opinion probably arises from the samples examined having                                      |                        |

| HONEY.           | Honey and Beeswax.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| BEES-WAX.<br>342 | been of different ages, as it seems likely that a certain amount of change<br>may go on after deposition in the comb.<br>Bees'-wax is a secretion elaborated within the insects' body from the<br>saccharine elements of the honey, which, extended in plates from beneath<br>the rings of the abdomen, and mixed with certain impurities, pollen, &c,<br>constitutes the comb or framework of the nest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                  | <ul> <li>Vem.—Shakad, madh, wax=worif, HIND.; Madhu, modhu, vt<sup>A</sup>x=mom, BENG.; Sahut, BKHARI; Saht, shahd, PB.; Polie, C. P.; Shahad, wax=* mdm, D E C; Mada, v/a.x**ména, MAR.; Madh<sub>%</sub> vtax=*min, Guz.; Ten, wa.x=moahukku,TAM.; Tine, wax=*mainarn, TEL. Jinu, v/a.x**nwna, KAN.; Ten, wa-x-meekuka, MALAY.; Piyd-ye, wax =pkayonii, BURM.; Pdni, vtax=itti, SING.; Madhu, mdkshika, v/a.x=madhujam, SANS.; Aasl, aaslun-nahal, wax=s/tawa, ARAB.; Shahad* angabin, waxmic\$?», PERS.</li> <li>References.—Hooker's Himatayan Journal, /., 201; II., 16, 276; Pharm. Ind., 277; Ainslie, Mat. Ind., I, 172; O'Shaughnessy, Beng. Dispensy 684; Moodeen Sheriff% Supp. Pharm. Ind., 172; U. C. Dutt, Mat. Med* Hind., 277; S. Arjun, Bomb. Drugs, 177; K. L. Dey, Bengal Drugs, it9 Irvine, Mat. Med., Patna, W2; Johnston, Chemistry of Common Life, Ed. Church, 179; Spons, Encyclop., 1127, 2042; Balfour, Cyclop., II*, 98; III., 1050; Davis, Rept. on the Trade and Resources of the Countries on the NW. Boundary of British India, App. ccxii; Special Reports fromConservator of Forests, S. Circle, Madras; Com. of Settlements and Agric, Panjdb, i883; Dir. Land Rec. and Agric, Bengal; Collector of Cuddapdh Dist., Madras; Collector of Trichinopoly Dist., Madras; Chief Commissioner, Burma; Govt. of Madras, Madura Dist.; Dir. of Land Rec. and Agric., Assam; Settlement Reports:—Jubbulpore, 87; Hoshungabad, 28\$; Bhundara / 20; Chanda, 109; Nimar, 1225; Upper Godavery, 40; Montgomery, 24; Gazetteers:—Hazara, i3; Montgomery! 23; Bombay, VI., S3; XV (Kanara), Pt. I., 104-106; Manuals of Administration, Madras, /., 314, 36i; II., 24; District Manuals:—Coimoa</li> </ul> |
| SOURCE.          | <i>tore, 5 / Trichinopoly, t6.</i><br><b>Source, Collection,</b> &c—Honey is a very plentiful wild product over<br>the greater portion of India,but is obtained artificially from domesticated<br>bees, only in the hills north of the Panjdb, and in certain districts of Burma<br>The following passages from reports published by the Governments of the<br>several Provinces and Presidencies, also from Gazetteers and other sources<br>may be given, as indicating the annual amount procured, the methods of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MADRAS.<br>343   | <ul> <li>collection, and trade in honey and wax in the different parts of the Empire <i>Madras.</i>—"The hive bee of Europe (Apis mellifica) is unknown in South India. There are four species of wild bee which attach their comb to branches, or place them in crevices of rocks or ruins. A. indica and A floralis are migratory, moving especially to localities where any plants o the Strobilanthes genus are in flower. A. nigrocincta remains in th same spot throughout the year. A small variety of this species is known as the 'Mosquito Bee' frequenting the plains and rocky hills throughout the Presidency The quantity of honey in its nest is small and not co good quality. The fourth species, A. dorsata, or the' Rock Bee,' is twice as large as A. indica. The honey is collected by jungle tribes who an familiar with the localities which the swarms frequent and refuse to leave. Regarding the Cuddapah district, the Collector writes: "Honey is collected in the forests in almost all the taluks and is sold at R2  to R4 a maun. The wax is here sold at R15 a maund. The right to collect honey is either farmed out or managed under <i>amdne</i> by the Forest Department. In 1888 and 1888, 243ft valued at R35 were collected by the Department, an 840ft valued at R29 by license." The Collector of Trichinopoly report that honey is generally collected in the mountainous and thick jungle such as those of the Pachamalais, the Marnagapuri, and the Korlavt hills. In the District Manual it is mentioned as one of the princip products of the Pachamalai hills.</li> </ul>                                                                                                       |

| Honey and Bees'-wax. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | HONEY.                      |
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| In a memoir by the Revenue Department on the Madura District the following occurs: "Honey is collected to a large extent in the Saduragi and Varshanad hills, and to a small extent from the trees on the plains. A measure of honey costs between 12 annas and Ri. The Conservator of Forests, in an interesting report furnished in July 1889, writes : • Honey and wax are forest products, and are either farmed out or collected departmentally, but in reality only a small portion of the quantity actually produced ever reaches the market <sup>f</sup> The following return has been furnished for South Arcot: I. <i>Collected by Department.</i> —In 1884-85, 1,484ft of honey valued at R76-12-7, 840ft of wax at R360, or a total of R436-12-7. In 1885-86, 171ft of honey, R21-4-5; 29ft of wax, Ric-3-0,—total R31-7-5. In 1886-87, 793ft of honey, R82-3-8; 209ft of wax, R80-i-!i,—total R163-1-7. In 1887-88, 244ft of honey, R35-1-8; 61ft of wax, R26-11-0,—total R61-12-8. In 1886-87 the sum annually realised by leasing out the right of collecting honey and wax was ft80; in 1887-88, R47 was obtained from this source for 1,120ft honey and 560ft of wax. The total amount realised by the Department during five years for honey and wax was thus R985-15-8."                                                                                                                                                                                                                                                                                                                             | MADRAS.<br>344              |
| produce collected by the Department itself very greatly exceeded propor-<br>tionately that obtained by the system of leasing out the trees.<br>The quantity collected in South Coimbatore in 1888-89 was 1,192 small<br>measures, and the revenue realised R264. The District Forest Officer of<br>Tinnevelly reports : * Three descriptions of honey are found in the forests, of<br>which one is said to be used only for medicinal purposes. The cost of<br>collection of the other two kinds is eight annas per Madras measure, and<br>the selling price Ri*4, for the best quality. The total yield varies consi-<br>derably, but including that from Zamin forests, it might amount to about<br>1,800 measures in a good year.' In South KanSra, 'bee-keeping is<br>unknown; wild honey and wax are collected from the jungles, the combs<br>being generally on large trees. The honey of the small bees is preferred<br>for medicine. Honey is collected by Government agency at a cost of R1-6<br>to Ri-14 a maund of 28ft. The quantity annually collected is 29 maunds,<br>and is generally sold at R2-10 a maund. <sup>1</sup> "                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Coimbatore<br>345           |
| In the Central Provinces.—The Report on the Settlement of the Upper<br>Godaveri District contains the following : "There are four different sorts<br>of honey produced in the jungles of this district: (1) <i>Kurra teneh</i> , (2)<br><i>Moosur teneh</i> , (3) <i>Tonudee teneh</i> , (4) <i>Pitwar teneh</i> , (5) <i>Kunagole teneh</i> ,<br>of which 1 and 5 are the most delicate, and the bees' nests of the same<br>(the former being found on branches, the latter in holes in the trunks<br>of trees) yield good wax. 2 is also found in holes in trees, 3 in holes in<br>the ground and ant-hills, while 4 is the honey of the large bee the nests<br>of which are found suspended as large combs from lofty trees and rocks.<br>The wax of all is good and is collected by <i>Gottehs</i> and <i>Kays</i> , and sold or<br>bartered to traders; and turmeric is sometimes employed to dye it yellow.<br>The honey is not exported." A similar account is given in the Settlement<br>Report of the Chanda District, in which it is, however, stated that the<br>honeys above described as Nos. 3 and 4 are alone of importance. A<br>comb of the former is said to yield on an average about one seer of honey<br>and two chittacks of wax; that of the latter, 10 seers of honey and 4<br>seers of wax. The Report on the N imar District describes the Ratgurk<br>hill as a "perfect hive of bees' nests," and further states that the honey<br>and wax are collected by a class of people called <i>Dhanook</i> and <i>Nahal</i><br>who perform their dangerous work with great dexterity. Honey is also | CENTRAL<br>PROVINCES<br>346 |

| HONEY.                                         | Honey and Bees'-wax.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| BENGAL.<br><b>347</b>                          | reported to be plentiful and good in the Jubbulpore, Bhundara, and<br>Hoshungabad Districts. No information is available of the total yield of<br>honey and wax in the Central Provinces, but from the foregoing accounts<br>the production would appear to be very great.<br>In Bengal—The Director of Land Records and Agriculture, in an in-<br>teresting report on honey, states that the bee is never domesticated, but that<br>a large amount of honey is gathered in the jungle and fields, especially of<br>Chutia Nagpur and the Sanderbans. The men who collect it belong to<br>the Bagdee caste, and are called moulays or "honeymen." The principal<br>honey season commences in January and lasts till the end of March, but                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                | <ul> <li>there" is another less important season in April and June. The honey obtained in February is considered the finest, is known as <i>dinhar m^dhu</i>, and fetches a high price, while that collected in June is the worst.</li> <li>The average amount collected and sold by the hill tribes of Chutia Nagpur is about 150 maunds at R4 a maund; while about 5,000 maunds are sold annually at Naluah, Khorumpara Ghât, Khari, and Harwa, at prices ranging from R8 to Rio per maund. The preparation and sale of wax are incidentally referred to in the report, but no information is given as to the extent of trade in that article.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| BURMA.<br><b>348</b>                           | <i>In Burma.</i> —Honey is found in large quantities in the jungles, and is<br>collected and much used by the natives. No reports of the annual amount<br>gathered are available. In the Amherst District, as in Madras, licenses<br>are granted for the right to collect honey and wax. In the Tongu District<br>wax is mentioned as being used in the manufacture of candles, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| e                                              | probably it is similarly employed in other parts. The report from the<br>Chief Commissioner shows that in the greater number of the Burman<br>districts bee-keeping is not known, but it appears that in the Thongwa<br>District bees are domesticated and honey collected from their "> <sup>ves</sup><br>Strettell ii» his Narrative of Travels in Upper Burma describes a with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                | bee, which builds large nests suspended from ledges of rocks. The nest<br>is conical in shape, 3 feet long, and as broad at the top. From these<br>hives, he says, large quantities of honey are collected. For the curiou<br>wax-like POON-YET of Burma,—see the articles on "Dammar," Vol. III.<br>p. 17; also" Poonyet, Vol. VI."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 30MBAY.<br><b>349</b><br>Kanara.<br><b>350</b> | In Bombay.—The Gazetteers contain very few references to this product, from which it may be presumed that it is not collected by any mean to the same extent as in Madras and the Central Provinces, Kanara however, appears to differ markedly in this respect from the rest.a the Presidency, for not only is honey collected to a large extent in that district, but a rudimentary form of becfarming is carried on. The $\pounds *$ ".*"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                | teer contains an interesting description of honey and wax $g^{a^{T}M'}$ ng from which the following has been compiled: Kanara; bees; are said t be of four kinds, named in the vernacular <i>togar-jetnu</i> , $to_{a^{*}}^{*} t_{a^{*}}^{*} t_{a^{*}$ |
|                                                | either on the upper limbs of the tallest trees (as many as twenty to thirt<br>sometimes occurring on a single tree), or attached to precipitous clifts<br>the sides of high bridges or houses, and similar inaccessible positions.<br>This bee is specially fond of the nectar secreted by the flowers of the<br><i>kárvi</i> , a species of Strobilanthes, and always abounds in the neighbour<br>bood of these plants. Oning to the inaccessible position of the combe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| . `                                            | hood of these plants. Owing to the inaccessible position of the combe<br>collection is an attended decomposition of the comber. It<br>effected during dark nights twice a year,—once just before the setting is<br>of the rains, in April-May, and again in October-November, the hone<br>of the latter period being known as the "grass harvest," and that of tr<br>former as the "main harvest." The combs are obtained from high trees D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Honey and Bees'-wax. (7- Murrry.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | HONEY         |
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| means of bamboos, the branches of which are lopped off to serve as steps;<br>while from cliffs, bridges, &c, the honey is generally collected by a gatherer<br>let down from the top in a basket or net suspended from a long rope.<br>Though the method of collection is doubly dangerous from the inaccessible<br>positions of the combs and the fierce nature of the bees, the harvest is a<br>plentifulr-one, and well repays collection. One comb is said to yield on an<br>average eight to fifteen " beer bottles " of reddish-brown honey, and from<br>one to two and a half pounds of wax.<br>The second or <i>tudabi</i> bee is much smaller, and builds a small comb,<br>only yielding from one to three " beer bottles " of honey, which, however,<br>is of superior quality and flavour. The combs of this variety are found in<br>the hcMows of trees or old walls. The third or <i>kol</i> bee is still smallar, and<br>its comb, which is built on thorn bushes or small plants, yields only about<br>a tea-cupful of honey. The fourth or <i>misri</i> bee is said to be about the<br>size of an ant, and to collect a honey much prized in medicine. It seems<br>doubtful if this is in reality a true bee. | BOMBAY        |
| The right to collect honey and wax is farmed out as in Madras, and is<br>productive of a fairly large but varying revenue, since higher bids are made<br>in years when the Strobilanthes plants are in flower. In the four years<br>ending 1880-81, R19,140 were thus obtained, or an annual average of<br>84,780. The estimated yearly outturn is about 568 cwt. of honey and<br>290 cwt. of wax : the latter is nearly all sent to Goa, where it meets a ready<br>sale for the manufacture of wax candles for the Roman Catholic churches ;<br>while the former is nearly all sent to Bombay, selling at 1 to 4 annas the<br>ordinary quart bottle according to quality.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | •             |
| The system of bee-keeping pursued in Kan ara, though rudimentary<br>and not extensive, is interesting as forming the only instance of its being<br>even attempted south of the Pan jab Himalaya. It is carried on only in<br>some of the small hill-villages, and the method is very crude, ^n empty<br>earthen pot is placed mouth downwards in a white-ants' nest, or, more<br>rarely, in a hole made for the purpose, a small opening is made at one<br>side, and the hive, thus completed, is left to take its chance of becoming<br>the selected quarters of the bees. If bees do come and build, they are left<br>unmolested for some time, after which the comb is extracted as carefully<br>as possible, every endeavour being made not to disturb the parts contain-<br>ing the young. By these means the bees are not frightened, and generally                                                                                                                                                                                                                                                                                                                                                                     | 3             |
| stay on for a year or two.<br>The honey thus obtained is principally employed for home medicine.<br>A report recently received from the Acting Director of Land Records<br>and Agriculture contains the information that the honey collected in<br>Kanara and sent to Bombay is purchased by grocers, who adulterate it<br>with treacle, or syrup, and that Mahableshwar honey is much prized on<br>account of its purity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |
| In the Punjab.—Bee-culture is extensively carried on in the Murree<br>hills, in thetahsil of Rawalpindi, in Hdzara, in the Simla hills and in Kulu.<br>In Hazara and the Pindi District the hive is constructed of mud, moulded<br>in & cylindrical shape, about 8 inches in diameter at one end and 16 to 20<br>inches at the other, and some 15 to 20 inches in length. This is inserted<br>by the bee-keeper into a hole in the wall of his hut, made to fit the larger<br>end. He then closes it up from the inside of the house, with a sort of<br>door made of grass and mud, and stops the smaller end also with mud,<br>leaving only a small entrance hole, about 1 inch in diameter. Having thus<br>prepared a hive, he, during the month of April, smears honey, green<br>bangh, or a mixture of ghur and milk, over its mouth. This generally<br>attracts occupants, which flying away return with a swarm, or should this<br>means fail, a captured swarm is shaken into the previously smeared hive.                                                                                                                                                                                                             | PANJAB<br>351 |
| H. 351                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |

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| <ul> <li>ally, but rarely, require to be artificially fed. The comb is general ready for removal in October or November, a process which is very simp accomplished by making a small hole in the back of the hive, and <sup>burnk</sup> some old cloth, tobacco, or cowdung below it. The bees fly out by the external orifice and cluster round the hive, after which the whole ba of the hive is removed and the comb extracted. A hive generally contains from 2 to 4 seers of honey and from 1 to f seers of wax. These a separated from each other. The "run" honey is sold at from 2 to 3 see a rupee, the undeaned wax at 2 to 2 seers a rupee, or when cleaned at a rupee.</li> <li>Bashahr, 352</li> <li>Bashahr, 352</li> <li>Bashahr, 352</li> <li>Bashahr, 0. Minniken, Esq., Deputy Conservator of Forests, Bashahr Division, in interesting communication on this subject, writes: "The management the bee is carried on in most villages as far up the valley" (of the but "as Zipe and the Runang pass. The largest returns of honey and y are obtained from the side valleys on the north and south of the ribelow Wangtu, where the rainfall is about 66 inches. In these valle houses—one, two, or three stories high—are especially kept for rearing b—small recesses, 1 foot by 1 foot by 9 inches, being let in along the w at 2 feet apart and closed on the outside by a wooden panel in which entrance hole is made. A man is usually in charge of each house, wh duty it is,/<sup>TM*</sup>, to prevent excessive swarming, which is done by giv each colony ample room, and sometimes by clipping the wings of queen bee; <i>second</i>, to keep the apiary well stocked with early swar and to guard it against the attacks of bears, martins, hornets, waa and caterpillars. Stocking is effected by rubbing the inside of the recee with a paste prepared from honey, white wild rose, roots of the Jun macrocgphala" (<i>dhup</i>) "and the petals and seed of the Pleurosy mus Govanianum (<i>espouse</i>), which is said to be most attractive to the qu bee; but as sufficint swarms are not caught in this way, cylindrica b</li></ul> | HONEY.  | Bee-keeping: in the Simla'Hills.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <ul> <li>352</li> <li>Q. Minniken, Esq., Deputy Conservator of Forests, Bashahr Division, in interesting communication on this subject, writes : "The management the bee is carried on in most villages as far up the valley" (of the but "as Zipe and the Runang pass. The largest returns of honey and y are obtained from the side valleys on the north and south of the ribelow Wangtu, where the rainfall is about 66 inches. In these valle houses—one, two, or three stories high—are especially kept for rearing be—small recesses, 1 foot by 1 foot by 9 inches, being let in along the w at 2 feet apart and closed on the outside by a wooden panel in which entrance hole is made. A man is usually in charge of each house, wh duty it is,/TM*, to prevent excessive swarming, which is done by give each colony ample room, and sometimes by clipping the wings of queen bee; <i>second</i>, to keep the apiary well stocked with early swar and to guard it against the attacks of bears, martins, hornets, was and caterpillars. Stocking is effected by rubbing the inside of the receewith a paste prepared from honey, white wild rose, roots of the Jun macrocgphala" (<i>dhup</i>) "and the petals and seed of the Pleurosy mum Govanianum (<i>espouse</i>), which is said to be most attractive to the qu bee; but as sufficient swarms are not caught in this way, cylindrical be formed of two or three lengths of hollow trunks, 2 to 3 feet in circumfere covered at the top, and with an opening on one side, are rubbed with paste, and set out in different places, 2 to 3 miles away, in order to can new swarms, which, when established, are taken to the apiary. In Bash proper, gurrahs are used instead of boxes. Besides these special be tablishments, the zamindars have places in the lower parts of their how the stablishments have places in the lower parts of their how the stablishments, the zamindars have places in the lower parts of their how the stablishments, the zamindars have places in the lower parts of their how the stablished are taken to the apiary. In Bash proper, gurrahs</li></ul>                   | PANJAB. | During winter the entrance hole is closed at night, and the bees occasion-<br>ally, but rarely, require to be artificially fed. The comb is generally<br>ready for removal in October or November, a process which is very simply<br>accomplished by making a small hole in the back of the hive, and $^{buTM}$ ing<br>some old cloth, tobacco, or cowdung below it. The bees fly out by the<br>external orifice and cluster round the hive, after which the whole back<br>of the hive is removed and the comb extracted. A hive generally con-<br>tains from 2 to 4 seers of honey and from   to f seers of wax. These are<br>separated from each other. The "run " honey is sold at from 2 to 3 seers<br>a rupee, the undeaned wax at 2 to 2  seers a rupee, or when cleaned at 1©<br>a rupee.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| hives. It is believed that the Yung " (the bee domesticated in the dist<br>"extracts honey and pollen from almost every flower, except the Jee<br>mine {chumbili}; that the honey from Plectranthus rugosus (pehi<br>the best and purest, and that after a rainy night, if the bees return la<br>with honey from the flowers of Pyrus Pashia (shegul), numbers of t<br>eat it and die; but no precaution appears to be taken by the villa<br>against this happening. It is also said that, when the bees have<br>lected honey and pollen from the male catkins of the Deodar, two-th<br>of the honey in the comb is quite bitter and useless, and that the ho<br>made from April to July is watery and of a yellow colour, but that<br>autumn store is of good quality. The honey is taken either at night of<br>the day-time by smoking out the bees, and to induce them to return v<br>is sprinkled about, and a noise made by whistling and rapping on I<br>plates; but if this plan does not answer, the queen, with the bees which<br>ter around her, is swept into a cloth or basket and returned to the hive,<br>which, however, all the combs on the outside of the recesses have<br>removed, leaving those in the recesses for the support of the bees, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | · · · · | Bee-keeping is carried on on a still larger scale in the Simla hills. W-Q. Minniken, Esq., Deputy Conservator of Forests, Bashahr Division, in an interesting communication on this subject, writes : "The management 01 the bee is carried on in most villages as far up the valley" (of the butlej) "as Zipe and the Runang pass. The largest returns of honey and wax are obtained from the side valleys on the north and south of the river below Wangtu, where the rainfall is about 66 inches. In these valleys, houses—one, two, or three stories high—are especially kept for rearing bees, —small recesses, 1 foot by 1 foot by 9 inches, being let in along the yams at 2 feet apart and closed on the outside by a wooden panel in which an entrance hole is made. A man is usually in charge of each house, whose duty it is,/ <sup>TM*</sup> , to prevent excessive swarning, which is done by giving each colony ample room, and sometimes by clipping the wings ot me queen bee; <i>second</i> , to keep the apiary well stocked with early swarns and to guard it against the attacks of bears, martins, hornets, wasps and caterpillars. Stocking is effected by rubbing the inside of the recessee with a paste prepared from honey, white wild rose, roots of the Junnee macrocgphala" ( <i>dhup</i> ) "and the petals and seed of the Pleurosper mum Govanianum ( <i>espouse</i> ), which is said to be most attractive to the queer bee; but as sufficient swarms are not caught in this way, cylindrical boxe formed of two or three lengths of holow trunks, 2 to 3 feet in circumference covered at the top, and with an opening on one side, are rubbed with the paste, and set out in different places, 2 to 3 miles away, in order to catcle with honey from the flowers of Pyrus Pashia ( <i>shegul</i> ), numbers of their houses resorved for the bees, and the boxes are sometimes used as permanen hives. It is believed that the <i>Yung</i> " (the bee domesticated in the district" extracts honey and pollen from almost every flower, except the Jessis mine ( <i>chumbili</i> ); that the honey from Plectranturs rugosus ( <i>peh</i> ) the bee |

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| Trade in Honey and Wax. ( <b>7.</b> Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | HONEY.                          |
| whose store has failed have to be fed during winter on a mixture of honey<br>and fine buckwheat flour.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FANJAB.                         |
| •• The honey is extracted by squeezing the combs 'over a fine bamboo<br>sieve, through which the honey drips into a vessel placed below, and the<br>wax is obtained by boiling the comb, and whilst boiling skimming off the<br>wax, anjj further refining it by straining, while it is liquid, through a thin<br>cloth. The refuse is about one quarter of the whole and is of no value.<br>The yield of honey from an apiary is from 30 to 50 pucka maunds, and<br>from a single hive 5 seers to 1J maunds, and from J seer to 5 seers of wax.<br>About one-fourth of the annual produce is exported, and three-fourths<br>consumed by the people.''<br>In+Kulu, bees are kept in the upper verandahs of houses in bee-hives                                                                        | Kulu.                           |
| formed of short lengths of the hollow trunks of trees, covered at the top, and<br>with an entrance hole at the side. The insects thrive best in the highest<br>villages, from which the flowery slopes above the forests are accessible.<br>Honey is also obtained in many parts of the Panjáb from the different<br>varieties of wild bee, but no returns of the total amount annually collected<br>are available. In Davies* <i>Trade Report of the Countries on the North-</i><br><i>Western Border of India, 1862,</i> it is stated that more than 100 maunds were<br>then exported from Kangra and Kulu to Ladakh and Yarkhand, and that<br>a large quantity was also annually exported from Afghánistan to Turkish<br>China where it was used in making "Goolkund" or Preserve of Rose flowers. | 353                             |
| It seems possible that should such a system of bee-keeping as that<br>just described be introduced into Bengal, Madras, and the Central Prov-<br>inces, the amount of wax and honey collected in India might be very<br>greatly increased, and bee-culture become an important industry. The<br>demand for wax for several manufacturing purposes is very large, and not-<br>withstanding the large amount produced in this country, the imports are<br>considerable. It may be interesting in connection with this to give a short                                                                                                                                                                                                                                                                   | ,                               |
| review of the trade during the past few years.<br>Trade-in 1875-76 the exports of wax were valued at R6,21,890, in<br>1880-81 at R5,45,no, in 1885-86 at R4J7,230, and in 1888-89 at R4,20,959.<br>The trade would thus seem to be falling off, but, perhaps, a larger amount<br>of wax produced in India is now being used up within the country. The<br>imports of foreign wax (excluding wax candles) were valued in 1875-76 at<br>R2O,oio, in 1880-81 at Ri,45,4.67, in 1885-86 at R34,244, and in 1888-89 at<br>R99,272, showing a marked increase. The exports of foreign wax are<br>unimportant.                                                                                                                                                                                               | TRADE.<br>Wax.<br>354           |
| The trade in honey is small and local. For the prices, &c, in different parts of the country, the reader is referred to the part of this article dealing with SOURCE, COLLECTION, &C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Honey.<br>355                   |
| Preparation.—Honey is sold either in the comb, as "comb honey" or<br>as "run honey" after extraction. This is ordinarily accomplished by<br>cutting the covering off the cells, and allowing the honey to flow from the<br>comb into a receptacle beneath, or by some method of compression and<br>straining. With improved methods of bee-keeping, which have lately<br>greatly developed in Europe and America, it is possible, by a simple adapta-<br>tion of the principle of centrifugal force, to completely empty a comb n a<br>few minutes, without destroying the fine structure of the cells. The<br>empty comb is then returned to the hive to be refilled.                                                                                                                                | PREPARA-<br>TION.<br><b>356</b> |

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Commercial bees'-wax is of two principal kinds, yellow and white Yellow commercial wax is obtained by melting the combs after expression of the honey in boiling water. It rises to the surface, leaving a great part of the impurities behind, and is either skimmed off or allowed to cool in the form of a cake. This process is repeated till the desired degree of purity

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| HONEY.                                                     | Domestic Uses of Honey.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| PREPARA-<br>TION.                                          | is obtained. The addition of nitric acid to the boiling water accelerates<br>the purification. White wax is manufactured from the yellow by rolling it<br>into sheets or ribbons and exposing these to the bleaching action of the sun.<br>By this means the surfaces of the ribbons are whitened, after which they<br>are again gathered together, remelted and again made into ribbons, in<br>order to expose a fresh surface, and this is repeated till the bleaching is<br>completed. The same result may also be more rapidly effected by treat-<br>ing the wax with sulphuric acid and bichromate of potash, when the liber-<br>ated chromic acid bleaches the whole mass in a few hours.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FOOD.<br>357                                               | Food.—Honey is highly appreciated by the natives of many parts of<br>India as an article of food. There seems to be little doubt, however,<br>that certain kinds of honey, or honey collected from certain flowers, is more<br>or less poisonous. This fact has long been recognised in India; thus Ainslie<br>writes of a peculiar dark greenish coloured kind, "which, according to the<br>Vytians, cannot be eaten with impunity." In the <i>Madras Quart. Journ.</i><br><i>Med. Sc, Oct. 1861, jgg,</i> Dr. Bidie also gives an account of a small<br>quantity of honey, obtained from the jungle of Coorg, having produced<br>symptoms of urtication, headache, extreme nausea, prostration, and in-<br>tense thirst. Again, Hooker, in his <i>Hintalayan Journal</i> , alludes to<br>poisonous noney, mentioning that honey is much sought for in Eastern<br>Nepál, except in spring, when it is said to be poisoned by rhododendron<br>flowers, just as that eaten by the soldiers in the retreat of the Ten Thousand<br>was by the flowers of R. ponticum. Strettell also mentions that at certain<br>seasons the honey obtained in Burma is poisonous. In the Panjáb Hima-<br>laya honey is principally used in the manufacture of an alcoholic liquor,<br>which the natives prepare by mixing one part with an equal quantity<br>of water, and leaving it to stand for a year in a closed earthen vessel. The<br>resulting liquor is very potent, a cupful is said to be sufficient to produce<br>intoxication. |
| MEDICINE.<br>358                                           | Medicine.—Honey forms the basis of several very popular preparations<br>and has long been an important vehicle for other medicines in the Hindu<br>Materia Medica. By Sanskrit writers new honey is considered to be<br>demulcent and laxative, while, when more than one year old, it is said to be<br>astringent and demulcent. Applied externally it is supposed to be a useful<br>detergent. The Koran also, in the chapter on The See, contains the fol-<br>lowing; "There proceedeth from their bellies a liquor of various colour,<br>wherein is a medicine for man. "In European medicine, however, it is em-<br>ployed only as a flavouring agent in cough mixtures, gargles, confections<br>and in the preparation of oxymels.<br>Wax, like honey, is supposed to be emollient and demulcent, and the<br>white variety is sometimes prescribed in doses of 10 to 20 grs. Its prin-<br>cipal value, however, is in the preparation of ointments. A useful substitute<br>for lard or simple ointment in India (where the latter is not only objected<br>to from caste and religious principles, but also rapidly becomes rancid)<br>is Ceromel, a mixture of one part of yellow wax and four parts of honey.                                                                                                                                                                                                                                                                                                      |
| DOMESTIC,<br>NDUSTRIAL,<br>& SACRED<br>USES.<br><b>359</b> | <ul> <li>Is Ceromel, a mixture of one part of yellow wax and four parts of honey. Domestic, Industrial, and Sacred Uses.—Honey is valued in India as an antiseptic, for the preservation of fruits, and for making cakes, sweetmeats, &amp;c, which are required to keep for some length of time. A curious adaptation of this property is mentioned by Hooker as employed by the Khásias. He writes, in describing their method of disposing of the dead : "The body is burned, though seldom during the rains, from the difficulty of obtaining a fire; it is therefore preserved in honey (which is abundant and good) till the dry season, a practice I have read of as prevailing among some tribes in the Malay Peninsula." The reader will remember its extensive employment in ancient Egypt for the same purpose. Honey plays an important part in many of the ceremonial customs of the Hindus. Thus H. 359</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Rock D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ammar.                                                                                                                                                                                                                                                                                                                                                                                  | (J. Murray.)                                                                                                                                                                                                            | HOPEA<br>odorata. |
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| <ul> <li>mixed with milk, curds, or clarified respectful offering to a guest, or to a of his bride's father. Honey sipping of certain castes, and one of the purplacing a little honey in the mouth of Yellow wax is employed for polish sealii-g wax, lithographic crayons, ar to make candles, and for modelling (<i>Spons* Encyclop.</i>). It is also employed seasers, to impart a fine gloss to fabre For descriptions of Indian White not the product of Bees, the reader is V; and Wax, Vol. VI.</li> <li>Hop, see Humulus Lupulus, <i>Linn.</i>; U</li></ul>      | bridegroom on his ar<br>forms part of the ma<br>ificatory ceremonies<br>a newly-born male ir<br>ing floors, and in the<br>nd mastics. When bl<br>g figures, flowers, ar<br>ployed, by calico-ma<br>rics.<br>Wax, Chinese Wa<br>s referred to the artic<br>RTICACEJ: ; p. 302.                                                                                                           | rival at the door<br>arriage ceremony<br>is performed by<br>fant.<br>manufacture of<br>leached it is used<br>and other objects<br>inufacturers and<br>x, and all others<br>eles on Oils, Vol.                           | DOMESTIC.         |
| HOPEA, Roxb.;<br>A genus of trees mostly resin-yield<br>species. It belongs to the Natural Order<br>allied to SMOREA.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ling, which comprises a                                                                                                                                                                                                                                                                                                                                                                 | bout 11 Indian<br>l is very nearly                                                                                                                                                                                      |                   |
| Hopea glabra, W. & A.; FL Br<br>Syn.—HOPEA WIGHTIANA, Var<br>Vern.—Kong, kongu, TAM.<br>References.—Beddome, Fl. Sylv<br>Gamble, Man. Timb.,40; W<br>Balfour, Cyclop., II., 101.<br>Habitat.—A large tree of the<br>Southern Carnatic at Tinnevelly (Bed<br>Structure of the Wood.—Beddor                                                                                                                                                                                                                                                                                 | . ft. GLABRA, Wight.<br>^ 96 (described under<br>Z. & A., Prodr., 85; 1<br>Western Peninsula<br>ddome).                                                                                                                                                                                                                                                                                 | r H. Wightiana);<br>Drury, V. PL, 248,<br>(Wight), of the                                                                                                                                                               | 360<br>TIMBER.    |
| timber of the Tinnevelly district, a<br>Drury.<br>H micronthe Hook f: FI Br                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                         | nd confirmed by                                                                                                                                                                                                         | 361<br>302        |
| H. micrantha, Hook.f.; FL Br. A<br>Vern.—Dammar-mata-koocking,<br>References.—Trans. Linn.Soc,<br>634 i Cooke, Gums and Gum-<br>Habitat. —A very lofty tree of Ma<br>Resin.—This tree, along with H. a<br>description of which the reader if<br>species. Cooke states, however, tha<br>and not so friable as that obtained f                                                                                                                                                                                                                                              | dammer batu, MALAY<br>xxiii., 160; A.DC,<br>resins, Q2; Smith, Die,<br>alacca, distributed to<br>odorata, yields the R<br>s referred to the arti-<br>at the resin of H. mid-                                                                                                                                                                                                            | <i>Prodr., XVI., 2,</i><br><i>150.</i><br>Borneo.<br>ock Dammar, for<br>icle on the latter                                                                                                                              | RESIN.            |
| <ul> <li>H. odorata, Roxb.; Fl. Br. Ind., J.<br/>THE ROCK DAMMAR OF COM</li> <li>Syn.—HOPEA FAGINEA, Hort.<br/>CANDRA, Buck.; H. WIGHTIA</li> <li>Vern.—Théngan, BURM.; Rima<br/>References.—Roxb., FL Ind., I<br/>120; Gamble, Man. Timb., 40<br/>Pharm. Ind., 33; Cooke, Gun<br/>Gums, 34, 37; Indian Foress,<br/>VII., 250; XI., 32i; XII., 73; S<br/>II., TOO; Burm. Gaz., /., 127,<br/>exxvii.</li> <li>Habitat.—A large evergreen tree,<br/>from Chittagong and Martaban do<br/>the Andaman Islands. In the Burm<br/>principally near mountain streams a</li> </ul> | <ul> <li>/., 308; Wight, III</li> <li>MERCE.</li> <li>Calc; H. EGLANDULO<br/>NA, Miq., not of Wall.</li> <li>Ia, AND.</li> <li>Ed. C.B.C., 4SS; Kurz,<br/>; Mason, Burma and It.<br/>is and Gum-resins, 91;<br/>ter, /., tog, n3, 363;<br/>Spons, Encyclop., 1645,<br/>, i33; Journ. AgriHor</li> <li>common in the fores<br/>won to Tenasserim, a<br/>na Gazetteer it is de</li> </ul> | SA, Roxb.; H. DE-<br>For. FL Burm., I.,<br>s People, 527, 757;<br>Watson, Report on<br>III., 22; VI., 12s<br>; Balfour, Cyclob'<br>t. Soc,X., Proceed'<br>ts all over Burma,<br>and found also in<br>scribed as " found |                   |

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| HOPEA<br>odorata                                           | Rock Dammar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <u>odorata.</u><br>RESIN.<br>365                           | tively scarce in Pegu, but plentiful in Tenasserim, and large specimens<br>are common east of the <i>Trit-toung</i> .<br>Resin.—This species is the principal source of thecopalline resin known<br>as Rock Dammar (see III., 17). The first mention of this resin, the writer<br>can discover, is that in the <i>Proceedings*of the AgriHorticultural Society</i> ,<br><i>August 1858 {Jour., Vol. X.</i> } in which it is recorded that a sample of the<br>resin of the <i>Thengan</i> of Burma (Hopea odorata) was presented by the<br>Rev. C. 8. Parish. In an accompanying letter that gentleman com-<br>mented on its resemblance to Dammar, and remarked, " this seems such a<br>nice, pure, white resin that 1 cannot but think that it might be turned to<br>many useful purposes," and further," as every third or fourth large tree<br>is a <i>Thengan</i> , the resin might be got, I believe, in any quantities.'' The<br>resin was examined and reported on very favourably by Dr. Barry, who<br>wrote, " although not soluble in spirits of wine, it is perfectly so in benzole<br>or turpentine. The varnish afforded by both reagents is clear and limpid,                                                                                                                                                                                                                     |
|                                                            | and dries almost instantaneously. It should take very well at home." Very little has been done during the last thirty years in investigating the methods of collection and preparation, or in developing the trade in this resin. Dr. Cooke, however, in his report published in 1874, described its properties as follows: "The resin derived from this source occurs in nodules about as large as a walnut, rounded, of a pale straw colour, sometimes almost colourless, brittle, with a shining resinoid fracture, scarcely distinguishable in appearance from the East-Indian dammar of the London markets. We have found it to dissolve with equal freedom in spirits of turpentine or benzole, producing a clear bright solution, which, when used as a varnish, dries rapidly and smoothly. In all essential qualities it seems to equal East-Indian dammar, even for microscopical purposes, and hence gives good promise of taking a similar place and rate. Externally it has a\sosuffic ent resemblance to make it difficult to discriminate the one from the other. The advantage in hardness is rather in favour of the <i>Thengan</i> . The London brokers class it as a copal, and value clear pale samples at a rate equal to that of East-Indian dammar, <i>vie.</i> , about 40 per cwt." There is no record of the employment of this <i>Thengan</i> resin for economic pur- |
|                                                            | poses by the natives of Burma, but it is probable that, like others of the<br>same class, it is used for caulking boats, and as a rough varnish to wood-<br>work, &c Major Protheroe, however, states that it is employed by the<br>Andamanese, mixed with bees wax and red ochre, to make a wax used<br>to fasten their spear and arrowheads. East-Indian Dammar, which appa-<br>rently this product ought to rival in commerce, is extensively employed<br>in the manufacture of varnishes for coach-builders and painters, in mount-<br>ing microscopic objects, and for other similar purposes, while inferior qua-<br>lities are employed in the locality of production for caulking boats and<br>making torches. For an account of the interesting honey-combed black<br>resin of Burma, called locally <i>poon-yet</i> or <i>pwai-nget</i> , which is supposed to<br>be mainly derived by a peculiar bee from this, and other allied species, the<br>reader is referred to the article on Dammar (Vol. III., 17), and to Poon-yet<br>in Vol. VI.                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br>Resin.<br><b>366</b><br>TIMBER.<br><b>367</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| Aı                                                                                                                                                                                                                                                                                                             | nother Gum-resin.                                                                                                                                                                                                                                                                                                   | (J. Muiray.)                                                                                                                                   | HORDEUM.                                                      |
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| last 20 years, and it is principal to the Burma Gazetteer contains be one of the finest timber the making cart wheels, canoes, Burma Forest Report, 188J-along streams, the wood of referred to. It is said to be Thinganshway, the similarity the habitat and timbers of meant is really H. odorata.          | s an account of the tree, in<br>rees of the country, and<br>and boats, and in hous<br><i>81, 13,</i> a tree met with<br>f which is in great deman<br>Hopea, sp., and has the v<br>of which to <i>Thingan</i> , and                                                                                                  | which it is said<br>to be employed<br>e-building. In<br>in narrow b<br>id for boat hulls<br>vernacular name<br>the resemblance                 | to<br>for<br>the<br>elts<br>s, is<br>e of<br>e of             |
| Hopea parviflora, Beddom                                                                                                                                                                                                                                                                                       | 5                                                                                                                                                                                                                                                                                                                   | D                                                                                                                                              | 368                                                           |
| References.—Beddome,<br>Gamble, Man, Timb.,<br>Balfour, Cyclop., II.,<br>Administr., II., 64.                                                                                                                                                                                                                  | KAN.; Irubogam, MALABA<br>Fl. Sylv., t. 7; Anal. G<br>40; Drury, U. PL, 247; Indi<br>100,• Indian For. Hep., 1863                                                                                                                                                                                                   | Gen., xxviii., in p<br>ian Forester, II.,<br>1-64; Madras Mar                                                                                  | 21 ;<br>b. of                                                 |
| forests of Malabar and South                                                                                                                                                                                                                                                                                   | • of Forests, Madras, me<br>ghi as "yielding a gum<br>which the uses are not k<br>d be available annually,                                                                                                                                                                                                          | ntions, in Dr. V<br>resin'' (proba<br>nown, but of w<br>at a cost of al                                                                        | Vat-<br>ably<br>hich<br>pout                                  |
| above remark, by Colonel<br>ence to this resin. From the<br>resin yielded by allied spe<br>chemical and economic, shou<br>Structure of the Wood.—<br>62 to 63ft per cubic foot (0<br>hardly known commercially,<br>Kanara, and I believe it will                                                               | Drury, the writer cannot fi<br>e abundance of the tree, an<br>ecies, it seems desirable<br>ld be accurately detei mine<br>Hard, brown, and close-g<br><i>Gamble)</i> . Beddome re An<br>but is much valued by<br>be of great value for gun                                                                          | ind any other re<br>ad the value of<br>that its proper<br>ed,<br>rained, weight f<br>rks, ''The woo<br>the natives of Se<br>carriage purpo     | efer-<br>the<br>ties,<br>TIMBER.<br>d is<br>500th<br>oses;    |
| it will also answer well for<br>much valued for temple buil<br><i>II. (1876-77)</i> , it is mentioned<br>moist evergreen forests of th                                                                                                                                                                         | ding purposes." In the <i>l</i> as one of the most valuab e Nilghiris.                                                                                                                                                                                                                                              | Indian Forester,<br>le timber trees in                                                                                                         | Vol.                                                          |
| H. Wightiana, Wall. ; Fa                                                                                                                                                                                                                                                                                       | l. Br. Ind. <sub>9</sub> /., 309; Wi<br>e is often diseased and cond                                                                                                                                                                                                                                                |                                                                                                                                                | bular 371                                                     |
| mass; the plant in<br>name of ARTOCARPUS<br>Vem.~-Kavsi, MAR.;<br>References.—Roxb., F<br>W. & A.,Prodr., 85;<br>Balfour, Cyclop., II.,<br>Habitat.—A large tree<br>southwards. It is most abu<br>Structure of the Wood.<br>parviflora, a first-rate coppic<br>teer describes it as yielding<br>f u c h used." | that state was described by<br>LANCEAFOLIA.<br>Kalbon, kiralbogi, kaiga, KAN<br>I. Ind., Ed. C.B.C.,63s; Bec<br>Drury, U, PI., 248; Lisbo<br>101; Bomb. GOB., XV., Pt.<br>of the Western Peninsula<br>ndant in South Kanára.<br>—''.Very valuable, and si<br>the firewood '' {Beddome).<br>'' a good wood, very har | Roxburgh under<br>N.<br>Idome, Fl. Sylv.,<br>n, U. PL Bomb.<br>/., 7r.<br>a from the Kon<br>milar to that o<br>The Kanára G<br>rd, and lasting | r the<br>t.96 .<br>, 14;<br>hkan<br>f H. TIMBER.<br>azet- 372 |
|                                                                                                                                                                                                                                                                                                                | , Linn.; Gen. PI, III.,                                                                                                                                                                                                                                                                                             |                                                                                                                                                |                                                               |
| A genus of the Natural Or<br>ern Africa, Temperate Asia,<br>strongly marked forms, which,<br>nists as referable to one spec<br>treated in this work under the<br>the non-typical forms as variet                                                                                                               | however, are now generally<br>cies. The subject of Barley v<br>heading of H. vulgare, Lin                                                                                                                                                                                                                           | There are many<br>regarded by bota<br>will accordingly be                                                                                      | 7<br>-<br>2                                                   |
| 18                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                     | <b>H.</b> 3                                                                                                                                    | 372                                                           |

# Dictionary of the Economic

| HORDEUN<br>vulgare. | 1 Varieties of Barley.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 373                 | Hordeum vulgare, Linn.; Duthie, Fodder Grasses of N. India, 6g,<br>pi. F, fig. 32; Duthie & Fuller, Field and Garden Crops of<br>N W. P. and Oudh, 0, pi. II.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                     | BARLEY, £ng.; ORGE, Fr.; GERSTE, Ger,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                     | VARIETIES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 374                 | <b>H.</b> aegiceras.—A peculiar form with cylindrical ears, arranged in a confused manner, nut in rows; found in Tibet ( <i>Royle; Thomson</i> ), and in some parts of the inner Himalaya ( <i>Stewart</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 375                 | H. cceleste.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                     | Vern.— <i>Ud, tdjad, &amp;jan,grim,</i> PB.; <i>Grim, nas,</i> LAD.; <i>Chdma,</i> BHOIIYA*<br>A variety grown in villages bordering on the snowy ranged of the<br>North-Western Himálaya, at high elevations from 7,000 to 12,000 feet.<br>Atkinson remarks: "The seed is sown in first class unirrigated land in<br>October and ripens in May. The average yield per acre is about fifteen<br>loads, worth Ri per load, and raised at a cost of about R8 an acre. The<br>produce is consumed locally by the Bhotiyas, being esteemed much too<br>poor a food for the lowland folk" ( <i>Atkinson, Him. Dist., 684s Stewart,</i><br><i>Pb. PL, 255</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 376                 | H. distichum.—The variety most cultivated in Europe having only two<br>developed rows of spikelets, the lateral ones being rudimentary or barren.<br>Its growth and cultivation have been experimentally tried in several parts<br>of India, for an account of which the reader is referred to the paragraph<br>CULTIVATION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 377                 | H. gymnodistichum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| -                   | Vern.—Paighambari, rasuli <sub>%</sub> TIBET.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                     | A beardless variety, having, like the preceding, only two rows of spike-<br>lets, an£ presenwhg further the curious character of having the flower-<br>scales non-adherent to the grains. These scales drop off in threshing,<br>leaving the grains naked like those of the wheat. Three sub-varieties are<br>said to be largely culivated in Tibet, a dull green, a white and a dark or<br>chocolate brown. It is said to be largely grown in the hills near Kotgarh,<br>but is rare in the plains. With regard to the origin of this variety, Oap-<br>tain Pogson communicated a report, at the meeting of the Agri -Horticul-<br>tural Society in January 1886, in which he stated that Indian wheat-<br>barley, as he termed it, was introduced into the Panjab and North-West<br>Provinces during 1881, by se«d obtained from Poo in Tibet. In Baden<br><b>Powell's</b> <i>Panjab Products</i> *however, written in 1868, <i>paighambrijau</i> , both<br>white and black, are mentioned as having been obtained from the inun-<br>dated lands west of the Sutlej, from the Lahore District, from Gujranwala,<br>Gugaira, Dera Ghazi Khan, and Kashmir. The description of the grain<br>there given appears to coincide with that of this variety. In 1884 Mr. |
|                     | irom a sample exhibited at Saharanour by a zamindar of the Muzaffarna-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                     | gar District. This was reported by him to have yielded 15 maunds of grain,<br>and 121 maunds of straw per acre. The samples sent were of two kinds (both<br>referred to the same variety) one because of absolute coloured the other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                     | white. Both were examined by experts and were submitted for inspection in<br>the London market, where they were received with great interest, and the opi-<br>nion was expressed that they might prove of very considerable value. In<br><b>T</b> Brown $f' TP?'^{f0r 18}S^{s a recent}$ examination of these grains by Mr. H.<br>the 'SZit^^urto'!5"?r- <sup>Tr</sup> ^tis ^corded, in which it is stated that both<br>value of the ^ofm^{11 the wl?!Je from K<*earh germinated well, but that the<br>'hi tnnn^ier as a malting grain was considerably impaired owing to<br>the spontaneous rupturing of the pericarp during ripening, which would<br><b>H. 377</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Varieties of Barley.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>(J.</b> Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | HORDEUI<br>viirkare                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| render the embryo very liable to be separated durin<br><i>Blt ti n</i> [888271) Further it would appear from th<br>rious wheat-like variety, especially the white form, is l<br>mercial value in Europe as a malting grain. It is<br>MacDoug Jl considered that if it could be possible<br>from Inr'ia in a sound condition, it would command<br>price.<br>H. hexastichum, <i>Linn</i> .<br>The barley, <i>pir excellence</i> , of India. As this is a<br>vated form in India, the enumeration of its vernacu<br>of its cultivation, &c, will be given under the gener<br>BotanLally, this variety is characterised by having s<br>spikelets arranged in two rows of groups of three, on e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | e report that this c<br>ikely to prove of con<br>stated that Messi<br>to send this varie<br>a ready sale at a hig<br>almost the only cul<br>lar names, description<br>ral account of Barle<br>ix rows of develop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>378</b>                                                                                                                                                                                                                                      |
| <ul> <li>rachis.</li> <li>Besides the above purely Indian varieties it may tion three, collected by Dr. Aitchison during the Commission.</li> <li>H. Caput-medusae, <i>Benth. &amp; Hook.f.</i></li> <li>Found in great abundance on the downs of Bac foot in height.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Afghan Delimitati                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | on <b>379</b>                                                                                                                                                                                                                                   |
| H murinum, <i>Linn</i> .<br>Common in cultivated land and along the banks<br>in the Hari-rud valley.<br>H. ithaburense, <i>Boiss</i> .<br>Very characteristic of the rolling downs of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | als <b>381</b>                                                                                                                                                                                                                                  |
| <ul> <li>great clumps up to 3 feet in height, and resembling in habit.</li> <li>BARLEY.</li> <li>Vem.—yav,,iaogjawa,s6jg HIND.; Jab, jau, j6o, BEHARI ; Nas, BHOT.; SVKIA, LASSA ; Tosa, NEI NW. P.; Thamatt, ndi,jawa, chak,jau (cut as pathd, sodjhotaky shiroka, tro, ne, chung, lugar arrak), (a.shes=idwa khar), PB.; Jao-tursh, jao shirin), AFG.; Snt&amp;, DEC.; Sdtu,jav, BOMB.; Jait, jav,yM-wah, 'Guz.; Barli-arisi, barli-arishi, yava, dhdnya bhedam, yavaka, yavala, barli-biya KAN.; Mu-yau, BURM. ; Yava,yavaka, situshuka, Ja6, PBRS.; Arpa, TURKI.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 120; Aitchison, Cat. Pb. and Si''d PL, 171; DC, O 3*Q; Aitch, Afgh. Del. Com. Rep. in Trans, of L IJI.* Ft. I., 127; Elliot, Fl. Andhr., 46, 73, 140, Pi its People, 477, 818; Pharm. Ind., 2§3 ; O*Shau 632; Moodeen Sheriff, Supp. Pharm. Ind., J£5; Hind., 270,324; Fliick. &amp; Hanb., Pharmacog., I\$th Ed., 742; Bent. &amp; Trim., Med. PL, 2g3; S. 153; Murray, PL and Drugs, Sind, 14 ; Irvine, Med. Top. Ajmir, i39 ; Baden Powell, Pb., P Him. Dist.y 320, 684, 73g ; Lisboa, U. PL Bomb, Pr., HO; Church, Food Grains of India, 99; 220, 230; Ayeen Akbary, Glad-win*s Trans., II., Cyclop., II., 101: Smith, Die, 40; Treasury of Him. Dist.y 320, 684, 73g ; Lisboa, U. PL Bomb, Pr., HO; Church, Food Grains of India, 99; 220, 230; Ayeen Akbary, Glad-win*s Trans., II., KYII., 267; Orissa, II., i33; NW. P., I. (Bund (Agra),lxxx;Rajputana, I., 109, 150,227, 254, 2 Bengal, 1882-83, 12; Yarkand Mission, Rep., Rep.:—Panjdb, Jhang, 84; Kohat, 122; Kang xxxix: Rohtak, 92; Kumdon, App., 32d; NW. kabad, 32; Central Prov., Nitrsingpur, 52/</li> </ul> | *<br>BENG.; Jowa kha<br>PAL; Jau, indarjau,yu<br>s fodder, ka'wid, ka<br>r, buga,chang), (spirit<br>(H. heacastichum~/Vi<br>Java, Utu, jav, MAI<br>TAM.; Pache ha ya<br>um, TEL.; Jnvegod<br>SANS.; Skaair, ARAH<br>Stewart, Pb. PL, 25<br>trigin Cult. PL, 367,36<br>inn. Soc, 2nd Ser., V<br>Q4; Mason, Burma a<br>sghnessy, Ben?. Disfer<br>U. C. Dutt/ Mat. Ma<br>72; U. S. Dispen.<br>Arjun, Bomb. Dru<br>Mat. Med., Patna, 4<br>Pr.9 228, 383; Atkinso<br>189: Birdwood, Bon<br>Royle, Prod. Res., 2<br>J5s ''9, 174; Balfo<br>Sot, I., S9*; Morto<br>V, 53; VIII, 182; 18<br>lelkhand, 86, 198; 1<br>256, 278; A dm R<br>1873, 77; Settleme<br>ra, 24; Simla, App. 1<br>P., Bareilly, 82; Al | 382<br>ar,<br>rk,<br>asil<br>ts=<br>z0-<br>K.;<br>va,<br>hi,<br>3.;<br>56;<br>68,<br>ol.<br>nd<br>us,<br>gs,<br>2;<br>on,<br>nb.<br>14,<br>ur,<br>on,<br>7;<br>U/.<br>ep.<br>cnt<br>U.,<br>ia-<br>ia-<br>ia-<br>ia-<br>ia-<br>ia-<br>ia-<br>ia- |

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| HORDEUM<br>vulgare.                      | Habitat of Barley.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Puigafe.<br>HABITAT &<br>HISTORY.<br>383 | Land R.e. TZ j?"-i Bengal; Reports of the Experimental Farms<br>N.W.*' b22?"/ TS W*: 57.4.3; Khandhh and Hyderabad,<br>1877; 1972 HW 188, Strin, 185, 56, 35; 1886, 617, 314; Reports of the<br>1882, 57.1771 HW 188, Strin, 185, 56, 35; 1886, 617, 314; Reports of the<br>1882, 57.1771 HW 188, Strin, 185, 56, 35; 1886, 617, 314; Reports of the<br>1882, 57.1771 HW 188, Strin, 185, 56, 35; 1886, 617, 314; Reports of the<br>1982, 57.1771 HW 188, Strin, 185, 56, 35; 1886, 617, 314; Reports of the<br>strin, 1991; Bomb, Administr, Rep., 1872, 73, 352; Jol, Agri-Horl<br>Sec., 1843, 279; 1844, 57.<br>Habitat & History An annual grass, producir Snanystems, from 2 to 3<br>feet s, from a single grain. The t bcal form ht the spinets arranged<br>sides of used the string of the sec. 1872, 73, 352; Jol, Agri-Horl<br>sides of newer? If Note the second form ht the spinets arranged<br>sides of the second string of the second string of the second string<br>symm S MANG The second string of the second string of the second string<br>symm S MANG The second string of the second string of the second string<br>symm S MANG The second string of the second string of the second string<br>symm S MANG The second string of the second string of the second string of the second string string string of the second string of the second string                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                          | to exist?n a'Jj? <sup>1Ch</sup> , is 419e only one of these which appears, at present,<br>«fdtte $\ddot{c}u^{1}$ ?''f <sup>011</sup> , if would <sub>*</sub> ''*thatthe foura/dsix-rowed Wleys<br>their ori Sto- TA Vaneties of the two-rowed form, or that they owe<br>extinct.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ţ                                        | been s^ted, $\overset{\circ}{>}$ hexastich $p_{i}$ , $\overset{\circ}{P}$ hexastich $p_{i}$ , $\overset{\circ}{P}$ hexastich $p_{i}$ , $\overset{\circ}{P}$ , $\overset{\circ}{P}$ hexastich $\overset{\circ}{P}$ , $\overset{\circ}{P}$ , $\overset{\circ}{P}$ hexastich $\overset{\circ}{P}$ , $\overset{\circ}{P}$ hexastich $\overset{\circ}{P}$ , $\overset{\circ}{P}$ hexastich $\overset{\circ}{P}$ , $\overset{\circ}{P}$ hexastich |

| This supposition is confirmed by the intimate connection of the grain with several of the rites and beliefs of the Hindú religion. Thus the God Indra is called, "He who ripens Barley." and the grain is employed in the ceremonies attending the birth of a child, weddings, funerals, and in certain -sacrificial rites. It is further supported by the antiquity of the Sanskrit name, Yava, which in the earliest times was probably applied as a general term to any grain or corn-yielding plant, and was only at a later date restricted to what, at that time, must have been probably the most important cereal.<br>In Glad win's translation of the 'Ain-i-Akbári the crop is said to have been one of the most important in Afghanistan and Kashm'r, and a large part of the revenue from these countries was obtained from barley, by exacting the usual two out of every ten kherwars produced.<br>CULTIVATION.<br>AREA.—It appears from the Agricultural Statistics of British India, that by far the largest quantity of this cereal is grown in the North-West Provinces and ihe Panjáb; Ajmere-Merwara, Bombay, the Central Pro* vinces, and Madras following on the list very far behind the two first, but in the order given. For the sake of comparison the following statements of the acreage under cultivation in these Provinces, during the last three years, may be here given :— | Cultivation of Bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ley in India                                                                                                                                                                                                                                                   | (J. M                                                                                                                                                                                                                                                       | urray.)                                                                                                                                                                                                                                 | IORDEUM<br>vilgare. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Image: North-Western C Unmixed         Image: North-Western C Unmixed         Acres.         Acres.<                                                                         | This supposition is confirmed by the inti<br>several of the rites and beliefs of the<br>Indra is called, "He who ripens Barley,<br>the ceremonies attending the birth of a<br>certain -sacrificial rites. It is further supp<br>krit name, Yava, which in the earlies<br>a general term to any grain or corn-<br>later date restricted to what, at that tim<br>most important cereal.<br>In Glad win's translation of the Ain<br>been one of the most important in Afgh<br>part of the revenue from these countries<br>acting the usual two out of every ten kh<br>CULTIVAT<br>AREA.—It appears from the Agricu<br>that by far the largest quantity of this of<br>Provinces and ihe Panjáb; Ajmere-Me<br>vinces, and Madras following on the liss<br>in the order given. For the sake of con<br>of the acreage under cultivation in the | mate connect<br>Hindú reli<br>.'' and the<br>a child, wed<br>orted by the<br>st times was<br>yielding pla<br>he, must ha<br>hanistan and<br>was obtain<br>erwars prod<br>ION.<br>ultural Stati<br>cereal is grow<br>rwara, Bon<br>st very far b<br>mparison th | tion of the g<br>gion. Thus<br>grain is en<br>dings, funer<br>antiquity of<br>s probably<br>nt, and was<br>ve been pro-<br>te crop is sa<br>kashm'r, a<br>ed from bar<br>uced.<br>istics of Br<br>wn in the N<br>nbay, the C<br>ehind the tw<br>e following | grain with<br>s the God<br>aployed in<br>als, and in<br>f the Sans-<br>applied as<br>s only at a<br>obably the<br>id to have<br>and a large<br>rley, by ex-<br>itish India,<br>North-West<br>entral Pro*<br>vo first, but<br>statements |                     |
| North-Western C Unmixed         1,349,000         1,716,400         1,670,800           Provinces         «         Wheat and Barley         ,         1,145,300         1,233,100         1,210,800           and Oudh.         (.Barley and Gram         ,         2,347>4<>0         2,463,600         2,642,000           North-Western Provinces and Oudh         .         4,841,700         5,4' 3,100         5,523,600           Panjáb         .         1,852,500         1,163,400         1, tio,600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1885-86.                                                                                                                                                                                                                                                       | 1886-87.                                                                                                                                                                                                                                                    | 1887-88.                                                                                                                                                                                                                                |                     |
| Panjab « 1,852,500 1,163,400 1, tio,600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Provinces « Wheat and Barley . ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1,349,000<br>1,145.300                                                                                                                                                                                                                                         | 1,716,400<br>1,233,100                                                                                                                                                                                                                                      | 1,670,800<br>1,210,800                                                                                                                                                                                                                  |                     |
| Bombay         «         41,200         38,000         41,200           Central Provinces         8,600         Not given         Not given           Madras         3>900          3,700                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Panjab • • • • «<br>Ajmere and Merwara<br>Bombay . «<br>Central Provinces                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1,852,500<br><b>63,300</b><br>41,200<br>8,600                                                                                                                                                                                                                  | 1,163,400<br>50,600<br>38,000                                                                                                                                                                                                                               | 1, tio,600<br>36,200<br>41,200<br>Not given                                                                                                                                                                                             |                     |
| TOTAL . 6,811,200 6,665,100 7,015,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6,811,200                                                                                                                                                                                                                                                      | 6,665,100                                                                                                                                                                                                                                                   | 7,015,300                                                                                                                                                                                                                               |                     |

Thus, excluding Bengal, and the Native States—tracts from which reliable statistics are not forthcoming—the total area averages about 7 million acres under barley, mixed or unmixed, of which more than three-fourths belong to the North-West Provinces. In these Provinces, Benares, Allahabad, Agra, and Rohilkhand are the most important barley-growing districts; in the last the grain is grown mixed with wheat, in Allahabad ancl Agra it is generally mixed with gram, while in the first it is most commonly/ grown alone. Barley, mixed and unmixed, occupies about 20 per cent. of the total calculated area in the thirty temporarily-settled districts of these Provinces, or 42 per cent, of the total area under spring crops.

these Provinces, or 42 per cent, of the total area under spring crops. METHODS.—In the North-West Provinces.—The method of cultivation in this, the most important barley-growing region, may be taken as typical and will accordingly be fully described. Barley is a rabi or spring crop, being sown in October and reaped in March or April. As already men. tioned it is not only grown alone, but also mixed with wheat, when the crop is called *gojai*, or with gram, peas, or lentils, when it is known as *bijra*, or (in the tracts below the hills) gochin. Messrs. Duthie an<1 Fuller state that the areas under barley alone, barley-gram, and barley.

METHODS. N.-W. Provinces. 385

| HORDEUN           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| vulgane.          | Cultivation of Barley in India,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CULTIVA-<br>TION. | wheat stand in the relative proportions of 15, 22, and 10. One of these crops is usually the <i>rabi</i> accompaniment of indigo or rice, since it is considered much better adapted than wheat alone, for growth on a soil which has not been allowed to recuperate itself by even six months' fallow. Rape (Brassicacampestris), Indian mustard (Brassica juncea), and <i>dudn</i> or <i>tara</i> (Erucasativaj are also commonly sown in barley fields either as a border, or in rows some 15 feet apart; linseed is also occasionally grown as a border. The soil (which is generally light and sandy, and but sparsely manured, except when the wheat-barley mixed crop is to be grown) is prepared In <i>Assauj</i> (September-October; by ploughing and cleaning, and when practicable the fields are irrigated by turning a stream into them from some neighbouring river. The amount of ploughing necessary seems to vary * <sup>nuCAA?</sup> different districts; thus in Rohilkhand. the operation is frequently performed as often as twelve times, while in Bundelkhand two or three are considered sufficient. Probably four ploughings is the average throughout the Provinces. Sowing in the irrigated fields takes place in October-November, and in the uplands in November-December, a little later than the sowing time of gram, and earlier than that of wheat. The seeds are sown in plough furrows either by hand direct, or down a hollow bamboo fastened to the plough stilt, to the average amount of about ioofc an acre. After the sowing is completed the seeds are covered in by the plough, the coarse clods of earth are broken by the <i>dalaya</i> , and kept steady by a man standing on it. Irrigation may or may not be employed, according to the amount of winter rainfall, and in districts which enjoy a tolerable certainty of these rains, it is but rarely carried out. A comparison of the total irrigated and unirrigated crops of the several divisions of the province show that irrigation is carried on to the greatest extent in Agra and Benares, to the smallest in Meerut and Rohilkhand, while the total i |
| cost.<br>386      | exception of possible irrigation, the crop is left very much to itself, till the season of ripening in March-April when it is reaped like wheat, by being cut in the middle of the stalk with a sickle, tied in sheaves, and stacked near the homestead to dry. When quite dry these sheaves are unbound and threshed out by a flat board with a short handle, termed a <i>mungra</i> , or in some of the north-eastern parts of Kumdon by a primitive form of flail, consisting of a long pliant stick. The grain thus separated is said to be mixed with the ashes of cowdung before being stored, to prevent the attacks of insects. In the case of mixed crops the barley and gram, or barley and wheat, are reaped, stored, and eaten as one.<br>COST AND AVERAGE OUTTURN.— Messrs. Duthie and Fuller give the following estimate of the total cost of growing an acre of barley :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   | R a. p.<br>Ploughing (four times)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   | Clod crushing- (four times) · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   | Sowing • • • • • • • • • • • • • • • • • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                   | Threshing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                   | Irrigation (twice)— Total . 11 12 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1                 | Canal dues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| {                 | Labour .<br>Rent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ł                 | GRAND TOTAL 2012 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | Н. 386                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | HORDEUM                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Cultivation of Barley in India. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | vulgare.                                    |
| The outturn of barley is, under similar conditions, from one-fourth to<br>half again as much as that of wheat. When irrigated the average may be<br>taken as 16 maunds to the acre of unmixed barley, 15 of wheat-barley,<br>and 14 of barley-gram, while on unirrigated soil the average is from 8 to 11<br>maunds for unmixed barley, from 7 to 10 for barley-wheat, and from 6 to 9<br>for baiJey-gram, the amount varying with the winter rainfall of the district.<br>The average outturn of straw is about one and a half times that of the<br>grain. In mixed crops about three-fifths of the total produce is barley.<br>(Duthie and Fuller, Field and Garden Crops.)<br>Experiments were conducted in the Government Experimental Farm<br>of the North-Western Provinces and Oudh at Allahabad in 1872 for the<br>purpose of introducing the English two-rowed barley into that province. In<br>the report on these experiments it is stated that the country barley, H.<br>hexasticum, gave a yield of nearly double the English grain. These results<br>discouraged further attempts, but they appear strangely at variance with<br>the outcome of later experiment carried out in the Nilghiris, and described<br>below in treating of Madras.<br>The average price realised for Barley during the past twenty years in<br>this province has been 1 rupee for from 27 to 28 seers.<br>In the Panjab.—The largest areas are in the districts of Peshawar,<br>Sirsa, Ferozepore, Hissar, and Gurgaon. The system of cultivation is very<br>similar to that already described as pursued in the North-West Provinces;<br>but the practice of topping an over-leafy crop, which is never followed in<br>the latter region, is said to be common, and the crop is generally grown un-<br>mixed, gojai and bijra being almost unknown. As in the North-Western                                                                                                                                                                                                  | OUTTURN.<br>387<br>Panjab,<br>388           |
| Provinces the crop in this province receives very little special attention.<br>Thus in the <i>Kamal Gazetteer</i> the system is described as follows: " Men<br>may be seen sowing barley at the very end of the season on the edges of a<br>swamp, still too wet to plough, with the intention of ploughing it as the<br>soil dries. The limit to sowing is expressed by the proverb ' <i>boy a Po</i> ,<br><i>diya kho</i> , '^ 'Sow in Po, and you lose your seed.' The field is ploughed two<br>to four times, the <i>sohagga</i> is passed over it, and the seed sown broadcast.<br>Manure is given if there is any to spare, which there seldom is, and water is<br>given if the needs of the other crops allow of it. It is seldom weeded<br>unless the weeds are very bad."<br>In 1876 an important and interesting official correspondence was carried<br>on regarding the quality of Panjab barley, which arose from complaints<br>made regarding it by the Veterinary Department. From this correspond-<br>ence it appears that the quality of the grain, at least at that time, suffered<br>severely from its being cut before it was quite ripe, and from its being<br>carelessly stored while damp, or in a damp place. One firm of brewers<br>who were applied to for an opinion reported that, by buying the barley<br>immediately after it was reaped and threshed, and storing it themselves,<br>they obtained a most excellent grain; while two other firms who seemingly<br>bought the barley when required for use in October, had great difficulty<br>in obtaining even fairly good barley, a large percentage being dead,<br>mouldy, or weevil-eaten. These facts point to careless and ignorant<br>methods of storing as the principal cause of the frequently inferior quality<br>of the grain, and to this being the point requiring attention in endeavour-<br>ing to improve it.<br>I he outturn per acre varies greatly in different districts, but the average<br>agrees with that in the North-West Provinces. The average price of the |                                             |
| grain during the past twenty years has been between 31 and 33-seers per<br>rupee.<br>In Central India and Raj put ana.—Barley is largely cultivated both in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>C</b> lentral India<br>and<br>Rajputana, |
| Ajmere-Merwara and in Rájputana proper, especially in its more northerly<br>H 389                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 389                                         |

| HORDEUM                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _vulgare.*                                                   | Cultivation of Barley in India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CULTIVA-<br>TION.<br>Rajputana.                              | portion. The system of cultivation is, on the whole, similar to that pre-<br>viously detailed, but the crop appears to be generally ploughed about six<br>times, manured, weeded at least once, and irrigated; in fact, to receive<br>altogether more attention than in many other parts. The cost of produc-<br>tion is about R28, the value of the crop about R34, and the consequent pro-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Bombay.<br><b>390</b>                                        | fit about R6 per acre. , *<br><i>In Bombay.</i> —It is principally grown in Gujarat. In an interesting<br>report on the subject the Acting Director of Land Records and Agriculture<br>writes: "In 1887.88 Gujarat alone had more than three-fourths of the total<br>"area of barley-cultivation in Bombay. It is less important in the Deccan.<br>In Gujarat it is generally an after-crop in garden rice lands or in soils too                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Central<br>Provinces.<br><b>391</b><br>Madras.<br><b>392</b> | sandy and open for wheat. It is irrigated and manured. The garc/sn rice<br>land is, previous to cultivation, manured to the extent of 12 cart-loads,<br>watered on the stubble in December, then ploughed twice and levelled.<br>The seed to the extent of 80 to 100ft is immediately thrown by hand into<br>the furrows, the sower following the plough. It is then rolled and watered<br>six or eight times, and harvested in April. The estimated acre yield is<br>from 1,020 to 2,270ft. According to experiments conducted on this crop,<br>the cost per acre comes to about R2O, and the value of produce to about Rai-<br>The fact that it is not subject to the wheat blight renders it a favourite<br>rain crop in the light lands of Ahmadnagar and Kaira. In the Deccan it<br>is grown as a garden crop, and rarely as an after-crop in rice fields.'' <i>m</i><br><i>In the Central Provinces.</i> —The crop of barley in these provinces is so<br>insignificant that during the past two years no returns of the area under<br>cultivation have been made.<br><i>In Madras.</i> - A s might be expected from the climate of this province,<br>barley is a very unimportant crop, only from 3,000 to 4,000 acres being<br>cultivated on the spurs ai.d slopes of the Nilghiris and Pulneys, fe-n-<br>deavours' were, however, made by the Agricultural Department in 1885-80,<br>to improve the quality of Nilghiri barley, and to increase the extent of its<br>cultivation, by introducing good seed both from the Panjáb and England,<br>and distributing it to the <i>rayots</i> . To ensure success and to help the people<br>with advice and instruction, these experimental trials of foreign seed, though<br>conducted by the <i>rayats</i> themselves, were placed under the supervision of an<br>agricultural inspector. In the report of the Department for 1886-87 it is<br>stated that the results with English barley (H. distichum) were very satis-<br>factory, a good crop having been, obtained which was purchased by the<br>Nilghiri Brewery Company. Panj ab barley on the other hand, was found to be |
| Bengal.<br>393                                               | <ul> <li>interior to that already grown in the district, and accordingly attempts to introduce the latter have been stopped. English barley is further favourably commented on in the last report (1887-88), in which it is mentioned that during 1887 nearly 5,000 bushels of seed were sold at an average price of Ri-12 per bushel. Every endeavour is being made to increase the cultivation of this important malting grain, for which there is great demand, and, as a consequence, a considerable augmentation of the area under cultivation and yearly outturn in the Presidency may be expected.</li> <li>In Bengal.—No returns are available of the area under cultivation, and the crop as a whole is unimportant. The Director of Land Records and Agriculture mentions that it is cultivated in the Bhagulpore Division and to a limited extent in Chutia Nagpur. As in other districts, it is a rabi crop, being sown in October-November and reaped in March-April. The ground is prepared by three or four ploughings, at intervals of four, or five days. The seed is then sown, and the soil harrowed, and ploughing and harrowing are repeated after three days. No mention is made of any further attention, in the form of irrigation or weeding, being paid to the crop.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| Product                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | tion and Cor                                                                                                     | nsumption of                                                                                                   | f Indian Ba                                                                                        | rley. (J. 1                                                                                           | viurray, j                                                                    | _                                                                                            |
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| Production and Consumption of Indian Barley. (J. Murray,) HORDEUM<br>•ulgare.<br>In Burma.—The Government of Burma reports: '* In Mandalay it is<br>the margin paddy of the district. It is sown in the month of January,<br>and reaped in the month of May, averaging 120 days; the cost of cul-<br>tivation being about R12 per acre, and the proceeds about R25. It is an<br>inferior kind of grain and only eaten by the poorer classes. In the<br>Thongwa District it is grown in a very small area, there being not even 50<br>acres in all. It is cultivated indiscriminately, and at little cost. In the<br>Yamethin and Meiktila Districts margin paddy is grown extensively. No<br>returns are available regarding the total area under cultivation."<br>TOTAL PRODUCTION AND CONSUMPTION.—By far the greater pio-<br>portion of barley grown in the country is consumed locally, a very small<br>quantity being exported. An attempt has been made by the calculations<br>shown in the adjoining table to arrive at a fairly accurate estimate of the<br>actual total outturn of the grain in India during the year 1887-88 excluding<br>Bengal, Native States, and tracts from which no reports are available.<br>The result is necessarily (from the number of averages which had to be |                                                                                                                  |                                                                                                                |                                                                                                    |                                                                                                       |                                                                               | •ulgare.<br>CULTIVA-<br>TION.<br>Burma.<br><b>394</b><br>PRODUCTION<br>and CON-<br>SUMPTION. |
| employed in cor<br>any noteworthy<br>interesting for p<br>Such a comp<br>cwt., 42,179,869<br>consideration.<br><i>Table showing of<br/>ing Bengal, N</i><br><i>coming in 188</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | mpiling it), or<br>y extent, on<br>purposes of c<br>parison show<br>cwt. were c<br>calculation<br>vative States, | only at best a<br>the side of<br>omparison we<br>we that of<br>onsumed in<br>of total procession<br>and Tracts | an approxim<br>of under-es<br>with the trace<br>the total pr<br>the country<br><i>duction of E</i> | nation, but in<br>timation, an<br>le statistics.<br>oduction of<br>during the<br><b>Barley in Ind</b> | t errs, if to<br>nd may be<br>46,604,007<br>year under<br><i>lia, exclud-</i> |                                                                                              |
| CROP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (Returns of                                                                                                      | APPROXIMATE<br>YIELD PER<br>ACR1.                                                                              | TOTAL YIELD<br>OF CROP.                                                                            | (In mixed o                                                                                           | D OF BARLEY.<br>crops barley<br>e whole.)                                     |                                                                                              |
| Unmixed—<br>Irrigated .<br>Unirrigated .<br>Barley-wheat—<br>Irrigated.<br>Un irrigated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ĭ> §ı, <b>३ 0</b><br>1*581,250<br>484,320<br>736 490                                                             | Maunds.<br>16<br><b>91</b><br>15                                                                               | Maunds.<br>2,53,00,000<br>1,46,26,562<br>72,64,800                                                 | Maunds.<br>2,53,00,000<br>1,46,26,562<br>43,58,880<br>35,96,076                                       | Cwt.<br>18,523,214<br>10,708,732<br>3,191,322                                 |                                                                                              |
| Un irrigated .<br>Barley-Gram—<br>Irrigated<br>Unirrigated .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 726,480<br>1,056,800<br>1,585,200                                                                                | 8±<br>14<br>7±                                                                                                 | 59,93,460<br>1,47,95,200<br>1.14,92,700                                                            | 88,77,120<br>68,95,620                                                                                | 2,632,841<br>6,499,320<br>5,048,578                                           |                                                                                              |
| TOTAL .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7,015,300                                                                                                        |                                                                                                                | 7,94,72,722                                                                                        | 6,36,54,258                                                                                           | 46,604,007                                                                    |                                                                                              |
| • Trade.—IMI<br>not made either<br>that the quantit<br>EXPORTS—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | by sea or<br>y is so small                                                                                       | trans-frontie                                                                                                  | er; it is the nworthy of s                                                                         | erefore to be<br>special notic                                                                        | e presumed<br>e.                                                              | Imports.                                                                                     |

EXPORTS—Are also very small in comparison with the approximate annual production.

The grain prior to 1887-88 was considered, in the Annual Reports of Trade and Navigation, under the heading of " Other sorts of grain," hence it is only possible to give the figures for last year. From these it ap-pears that the total exports by sea to foreign countries during that period were 29,575 cwt., valued at R89J76, of which Bombay shipped 18,688 cwt.

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Exports. 397

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| HORDEUM                           | Chemistry and Medicinal Properties'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| _vulgare                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MEDICINE.<br>Seeds.<br><b>398</b> | Bengal 6,873 cwt., and Sind, 4,014 cwt., valued at (£58,632, £20,^56, and R 10,588, respectively. The country which imported most largely was Persia, with 10,358 cwt., following on which were Arabia with 7,675 cwt., Ceylon with 7,539 cwt., and Aden, the United Kingdom, Zanzibar, and "other countries," with insignificant quantities.<br>Medicine.—The husked SEED of H. distichum occupies a place <sup>0</sup> in the Pharmacopoeias of England, the United States and India, under the name of HORDEUM DECORTICATUM or Pearl Barley. The grains of this variety of prepared barley are sub-spherical or ovoid, about two lines in diameter, of a white farinaceous appearance, and have the peculiar taste and odour common to most of the cereal grains. An account of the preparation of                                                                                                                                                        |
| Chemistry,<br>399                 | "pearl barley " will be found under the heading FOOD.<br>CHEMISTRY.—The grain of H. hexastichum is frequently used in this<br>country instead of that of the officinal plant, and is exactly similar in medi-<br>cinal properties. Chemically the grains contain (along with the food-<br>forming constituents, which will be discussed hereafter) from 13 to 15 per                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                   | cent of water, and after drying they yield about 3 per cent of fat oil, with insignificant proportions of tannin and bitter principles, residing chiefly in the husks, and 2*4 of mineral ash. The oil, according to Hanamann.is a compound of glycerin with palm'uic and lauric acids, or less probably with a provide fatty acid. The was found by Lowmon to contain 2g per                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | a peculiar fatty acid. The ash was found by Lermer to contain 2g per<br>cent, of silicic acid, 32*6 of phosphoric acid, 227 of potash, and 37 of lime.<br>Besides these constituents Lintner in 1868 demonstrated the presence of<br>a little cholesterin in the grain, and still later Kuhnemann extracted from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | it a crystallized dextrogyrate sugar, and an amorphous laevogyrate mucila-<br>ginous substance, sinistrin, and demonstrated the absence of dextrin<br>( $Fla'kiger$ and $Hanbury$ ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                   | MEDICINAL PROPERTIES.—Barley is demulcent, and easy of digestion,<br>and is for these reasons much used in the dietary of the sick. In India                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Grains.<br>400                    | <i>saktu</i> , or powder of the parched GRAINS, is much employed in the form of<br>a gruel in cases of painful and atonic dyspepsia. In European practice<br>Barley water, a decoction of the grain, is principally prescribed, and is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Leaf.<br>401                      | valuable in cases requiring demulcent treatment. Dr. Irvine states that<br>in Patna the ASHES OF THE LEAP are employed in the formation of cooling<br>sherbets; and Stewart writes that the ASHES OP THE STALKS are pre-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Stalks.<br>402<br>Malt.           | scribed for indigestion in the plains of the Panjab. Preparations of MALT<br>have acquired some reputation of late years in Europe and America, since<br>they are more demulcent and nutritious than those of the unmalted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 403<br>Wort                       | barley. Malt extract may be prepared by boiling Iwo to four ounces of<br>the germinated and dried grain in a quart of water and straining. When<br>hops are added, the decoction becomes WORT, and acquires tonic pro-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FOOD.                             | perties, which have been found especially valuable in cases of debility fol-<br>lowing on long continued chronic suppuration.<br>Food.—The food-forming constituents of average husked Indian barley                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 404                               | are, starch 63 per cent, cellulose 7 per cent., albumenoids 11*5 per cent.,<br>with small quantities of oil, ash, fibre, and 12*5 per cent, of water. The<br>nutrient-ratio is given by Church as 1: 6*3 and the nutrient value as 845.<br>On comparison of the above with the results of analyses of English barley<br>it will be found that the latter show a smaller percentage of albumenoids.<br>The process of cleaning barley for food purposes is, in this country, carried<br>out as a rule, by pounding in wooden mortars and winnowing, or, in the<br>North-West Provinces as already described, by beating with a flat board.<br>It is then ground into coarse meal, from which either alone, or mixed<br>with the meal of wheat or gram, <i>chapattis</i> are made and baked ; or a<br>thick gruel or pasty mass is made, to which a little salt is added, and the<br>preparation is eaten with garlic, onions, or chillies. In either of these |

| Modes of Preparat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | on of Barley.                                                                                                                                                                                                                                                                                                                                                                       | <b>(7.</b> <i>I</i>                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                            | HORDEU           |
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| forms it is a staple article of food of th<br>country, especially in the North-West<br>The grain thus roughly cleaned<br>albumenoids than the more carefully<br>partly owing to the higher percentage<br>tornfer, partly to the amount of the<br>imperfect methods of cleaning it. Th<br>meal of higher nutritive value than E<br>more difficult of digestion, and hence<br>dyspeptics and invalids generally.<br>The grain in England undergoes<br>which several different sorts of bar<br>names are given in commerce. This<br>ing the hard dried barley between<br>apart as to rub off its integuments<br>may be a little approximated, and<br>varying in cleanness. Church, in d<br>of barley yield I2^1b of COARSE DUST<br>B 1 <i>YY</i> d<br>By closer and longer grinding Blocks<br>and becomes "POT "or "SCOTCH<br>ther ground yields 25}fb of "\EARL DU<br>Thus from 100ft only 37ffl> of pear<br>actual loss unaccounted for occurs,<br>"dusts" above mentioned. These<br>waste products, are of considerable r<br>as the following figures given by Chu | e poorer class<br>Provinces, th<br>and ground<br>prepared cul<br>of nitrogen<br>richly album<br>ough this fac<br>nglish, it at t<br>partly unsu<br>an elaborate<br>ey are produ-<br>process cons<br>horizontal m<br>without crush<br>by this mean<br>escribing the<br>and become<br>d Barley yiel<br>BARLEY," wh<br>ST " and beco<br>l barley is of<br>and the ren<br>dusts, though | tes in many<br>ne Panjáb, a<br>is much n<br>inary barley<br>naturaljy exi-<br>nenoid husk<br>t renders In<br>the same tin<br>its it for the<br>process of e-<br>uced, to whisists essentia<br>nillstones, pl-<br>ning it. Th<br>ns results a<br>process, wri<br>"BLOCKEI<br>ds 14} ft (i-<br>uich again o-<br>omes "PEAR<br>btained, 10<br>nainder com- | parts of the<br>ind Oudh.<br>ore rich in<br>of Europe,<br>isting in the<br>left by the<br>irian barley<br>ne makes it<br>e dietary of<br>cleaning, by<br>ich various<br>ally in pass-<br>aced so far<br>ie millstones<br>re obtained<br>tes: "100ft<br>D BARLEY "<br>FINE DUST<br>n being fur-<br>L BARLEY."<br>per cent, of<br>sists of the<br>considered | vulgare<br>FOOD. |
| Water •<br>Albumenoids • •<br>Oil •<br>Starch •<br>Fibre •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Coarse<br>Dust.<br>1 O<br>7-0<br>17<br>46*9<br>24'S                                                                                                                                                                                                                                                                                                                                 | Fine Dust.'<br><b>13°1</b><br>17*6<br>6-<br>50*5<br><b>8-5</b>                                                                                                                                                                                                                                                                                          | Pearl Dust.<br>13*3<br>12*1<br>3*4<br>67*2<br>i-8<br>2*2                                                                                                                                                                                                                                                                                                   |                  |
| Ash<br>Church, however, takes care to m<br>representing percentage of albument<br>because the nitrogen from which they<br>gether in the albumenoidal constitut<br>from the totals given as probably like<br>Barley in one or other of these for<br>cookery as a bland demulcent grain in<br>also employed by the poorer classes in<br>Fodder.—Barley has of late ye<br>owing to its cheapness and value as a<br>in the Panjab for this purpose, the c<br>when quite young without marked<br>( <i>Stewart</i> ).<br>In the report on the Experiment<br>1886-87, it is recorded that experiment<br>year, to determine the pecuniary benwith the result that the balance was<br>even in a year when fodder was                                                                                                                                                                                                                                                                                                                                                        | olds are in a<br>rare calculat<br>nts, aud sugged<br>y to yield a p<br>rms is much<br>the preparate<br>certain loca<br>ars attracted<br>fodder. It l<br>rop being cut<br>injury to th<br>tal Farm of<br>ents were tri<br>efit of growing<br>very much i                                                                                                                             | Il these cas<br>ted does no<br>gests the de-<br>more accura<br>a employed i<br>tion of soups<br>lities to mak<br>considerab<br>has long bee<br>two or even<br>he final yie<br>Hyderabad<br>ed, during to<br>ng it purely<br>n favour of                                                                                                                 | t the figures<br>es too hieh,<br>t exist alto-<br>duction of \<br>te result.<br>n European<br>s, &c. It is<br>te bread.<br>ble attention<br>en employed<br>three times<br>ld of grain<br>in Sind for<br>the previous<br>as a fodder,<br>this method,                                                                                                       | FODDER<br>405    |

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| HORNS.                                                        | Alcoholic Liquors from Barley,                                                    |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |  |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| FODDER.                                                       | this interesting trial may be shortly given in tabular form:—                     |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                            |                                                                                                                                                                                                                                             |  |
|                                                               | 5                                                                                 |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   | YIELD PER ACRE.                                                                                                                                                                            |                                                                                                                                                                                                                                             |  |
| -                                                             | No.                                                                               | Area.                                                                                                                                                                                                                                                                                                                                 | Description.                                                                                                                                                                                                                                                                                                                                                                                                                                      | Grain.                                                                                                                                                                                     | Straw.                                                                                                                                                                                                                                      |  |
|                                                               | 1<br>2<br>1,2<br>3<br>4                                                           | Gunthas.<br>8<br>8<br>(Same plots) •<br>8<br>8                                                                                                                                                                                                                                                                                        | Cut before ripening<br>Cut in grain, green<br>Second cutting<br>Cut ripe                                                                                                                                                                                                                                                                                                                                                                          | 3b<br><br>f "56<br>i 62<br>j 2,145<br>1 2,931                                                                                                                                              | ft<br>21,740<br>14,925<br>280<br>310<br>4,270<br>4^28                                                                                                                                                                                       |  |
|                                                               | R7'<br>'' <i>b</i><br>bot                                                         | 7-0-8, or a balance<br>The straw of even<br><i>h&amp;sa?</i> but is inferie<br>h horses and cattle                                                                                                                                                                                                                                    | he yield of plots 1 and 2<br>in favour of the fodder crop<br>ripe barley is a fairly good<br>or to that of wheat. The g<br>e, either given alone, or mixe<br><b>ndSacredUs«Th</b>                                                                                                                                                                                                                                                                 | of R17-4-&-<br>fqdder who<br>grain, is a g<br>ed with grai                                                                                                                                 | en cut up-as<br>good-feed-før<br>m, when it is                                                                                                                                                                                              |  |
| DOMESTIC,<br>INDUSTRIAL.<br>and SCARED<br>USES.<br><b>406</b> | in<br>sur<br>ing<br>and<br>for<br>the<br>ma<br>to<br>an<br>the<br>mi<br>tue<br>sp | parts of India in the<br>S its value for this j<br>a is an intoxicating<br>g the employment of<br>d on the Sutlej a k<br>mer case, being br<br>e size of a fig, called<br>ade by thea & of th<br>the West, from ba<br>d an herb which is<br>e Sutlej, Moorcroft<br>ixed with it, and th<br>des is added to pro-<br>irits made from ba | e preparation of a kind of be<br>purpose has been long <sup>know</sup><br>drink prepared from barley <sup>k</sup><br>f barleyforthis purpose in the<br>ind of beer is made from its<br>ought from Tibet as little ^<br>d pab or phap. In Ladak all<br>e same substance which is saurley flower, mixed with close<br>probably an Umbell.fer (and<br>t states that in the preparate<br>revent indigestion. In Laho<br>urley are used by some of the | er, $\mathbf{x}$ spirit<br>". The Sa<br><b>Stewart w</b><br>Pan jg':<br>s p M « fe<br>so, amilan<br>id to be m<br>oves '' i ^<br>d then fer TM<br>ation ef *B<br>c.f^'''^*TM<br>ul A ^ ^ ' | uous liquor,<br>nskrit Yava-<br>rites regard-<br>"In Lahoul<br>rment in the<br>oking cakes,<br>r beverage is<br>ade in Drás,<br>$X \wedge f $ On<br>$A^n \wedge J > "£ beer, nceis 'J'' >? ^ 'JJ abitants and anufacture or the article on$ |  |
| Malt Liquors<br>407                                           | th<br>It                                                                          | e manufacture of sa<br>.Barley, is require<br>is a considered, a sy<br>a r S I i r<br>ith the God Indra.<br>ig the birth.off ar                                                                                                                                                                                                       | $d^{\wedge} \wedge h^{\prime} \wedge S S S$<br>mbol of wealth and a in Ind<br>it I L $\wedge$ SI $\vee \wedge t^{\wedge}$ ii $c^{\wedge}$ if<br>It is specially $*$ <sup>n</sup><br>rinfant, we^idmgs iant *                                                                                                                                                                                                                                      | ls of the H<br><sup>^</sup> is claimed<br>ia <sub>part</sub> i <sub>C</sub> ulan<br>in the cerem<br>in d at certa<br>in a at certa<br>in a at certa                                        | indu religion<br><b>by a Jolo</b> -<br>rly, associated<br>onials attending<br>in, sacrifices;<br>$j^{n}$ , a                                                                                                                                |  |
| <b>408</b>                                                    |                                                                                   | n the journ day<br>f game is played<br>nown in the Sanski<br>ornbeam, Indian<br>HORNS,                                                                                                                                                                                                                                                | of t t e j j t j j <sup>^</sup> barley<br>in wruch <i>VyY</i> .?*<br>it as <i>Yava-caturtht</i> .<br>a, see Carpinus viminea, <i>W</i><br>ANTLERS, AND HC<br><i>Fr.</i> : Horn, <i>Ger</i> .<br>y utilised in the manufactur                                                                                                                                                                                                                      | all.; Vol. I                                                                                                                                                                               | r each ether<br>I., 182.<br>RK.                                                                                                                                                                                                             |  |

| <b>Characters and Composition of Horns.</b> (J Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | HORNS.             |
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| <ul> <li>articles on the animals as they occur in this work, grouped under their popular names. For information regarding ANTLERS, see DEER, Vol. III., 55; and for "IVORY/' see KLEPHANT, Vol. III , 208. Axis maculatus, Gray. The Spotted Deer.</li> <li>A. porcinus, Zimm. The Hog Deer.</li> <li>Bubalus ami, Shaw. The Wild Buffalo, feapra hircus, Linn. The Domestic Goat.</li> <li>C. megaceros, Hutton. The Markhor.</li> <li>C. sibirica, Meyer. The Himálayan Ibex.</li> <li>Cervulus aureus, Ham. Smith. The Barking Deer.</li> <li>Cervulus aureus, Ham. Smith. The Gayal</li> <li>G. gaurus, Ham. Smith. 'Ihe Gaur or Bison of Anglo-Indian Sportsmen.</li> <li>G. sondaicus, Muller. The Burmese Wild Bull.</li> <li>Gazella bcnettii, Sykes. The Ravine Deer, Goat Antelope, or Indian Gazelle Antelope.</li> <li>Hemitragus hylocrius, Ogilby. The Nilghiri Wild Goat, or '' Ibex.''</li> <li>H. jemlaicus, Smith. The Ther, or Himdlayan Wild Goat.</li> <li>N. goral, Hardu. The Gural, or Himdlayan Chamois.</li> <li>Pcephagus grunniens, Linn. The Yak.</li> <li>Rhinoceros indicus, Cuv, The Great Indian Rhinoceros.</li> <li>R. sondaicus, Sol. Muller. The Lesser Indian Rhinoceros.</li> <li>R. sondaicus, Sol. Muller. The Serven or Bornest Goat.</li> <li>N. goral, Hardu. The Giral two-horned Rhinoceros.</li> <li>R. sondaicus, Cuv, The Great Indian Rhinoceros.</li> <li>R. sondaicus, Sol. Muller. The Lesser Indian Rhinoceros.</li> <li>R. sondaicus, Sol. Muller. The Serven Deer.</li> <li>R. eldii, Guthrie. Eld's Deer, the Manipur or Burma Stag.</li> <li>Rusa aristotelis, Cuv. The Samber Deer, or Elk of Indian Sportsmen.</li> <li>Besides these wild animals, the different varieties of domesticated ox, buffalo, and sheep, yield horns which are collected with their hides or skins, and, indeed, these form the major part of the comme</li></ul> |                    |
| <ul> <li>Vern.—Sing, HIND.; Sing, Guz.; Kombit, TAM. J Kommit, TEL.; Tanduk sangú, MALAY.</li> <li>References.—Baden Powell, Ph. Pr., /., 159; Royle, Prod. Re&amp;our., 4; Forbes Watson, Ind. Sury., I., 386; Spons, Encyclop., 1132; Balfour, Cyclop., 11, 102; Ure, Die. Indus. Arts and Manu., 11., \$97! Hoey, Trade &amp; Manufactures of N. India, 130; Madras Man. of Administr., 361; Bombay Administr. Rep., 1871-72, 378; Settlement Reports, Upper Godavety Dist., 40; Gazetteer, Bom., X., 188; XV., pt. it., 70.</li> <li>CHARACTERS, COMPOSITION, &amp;C.</li> <li>The name horn is applied to the organs of attack and defence, which project from the heads of various species of animal. Anatomically the\ are of very various structure, and, according to Professor Owen, " belong to two organic systems as distinct from each other as both are from teeth. Thus the horns of deer consist of bone, and are processes of the frontal bone; those of the giraffe are independent bones, or epiphyses, covered by hairy skin; those of oxen, sheep, and antelopes are *apophyses " (or direct processes) " of the frontal bone, covered by the corium " (or skin) "and by a sheath of true horny material;" those of the pronghorned antelope, consist at their bases of bony processes covered by hairy skin, and are covered by horny sheaths in the rest of their extent. They thus combine the character of those of the giraffe and ordinary antelope, together with the expanded and branched form of the antlers of the deer. Only the horn of the rhinoceros is composed wholly of horny matter, and this is disposed in longitudinal fibres, so that the horns seem rather to</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | CHARACTERS.<br>409 |

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| HORNS.          | Industrial Uses of Horn.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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|                 | <ul> <li>consist of coarse bristles, coarsely matted together in the form of a more o less elongated sub-compressed cone." So-called horns may thus b roughly divided into two large classes, comprising five sub-divisions :— <ol> <li>I.—Horns consisting of bone, and having no true horny matter in thei structure.</li> <li>(1) True processes of bone, eg., antlers of the deer. f</li> <li>(2) "Epiphyses " or separate pieces of bone, covered by skin, e.g. horns of the giraffe.</li> </ol> </li> <li>II.—Horns more or less consisting of true horny matter.</li> <li>(1) Processes of bone covered at the base by hair, and tipped by horn, eg., horns of the prong-horned antelope.</li> <li>(2) Processes of bone covered by horn, eg., horns of the ox. •,</li> <li>(3) True horn, e.g., nasal horn of the rhinoceros.</li> <li>True horny matter, found in class II, is formed by a modification o epidermal tissue (the superficial layers of the skin), and consists of an albumenoid material called keratin.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| USES.           | INDUSTRIAL USES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>410</b><br>, | Horns of the 1st class—Are largely exported from India, which is<br>the principal source of the supply of Great Britain. The antlers principally exported are those of Axis inaculatus and Rusa aristotelis. 'I hose<br>of the latter rarely exceed 40 inches in length, and are generally under<br>three feet, but four feet along the curvature has been recorded. They com-<br>sist of a basal antler springing directly from the burr or base of the horr<br>and pointing forwards, upwards and outwards, the beam bifurcating a<br>the extremity, and a snag separating posteriorly and pointing obliquely to<br>the rear. The h-rns of Axis maculatus are about 30 inches in length<br>have a long antler sweeping upwards and backwards, with one basal and<br>one subterminal snag, the former projecting forwards and upwards from<br>the beam. 'The whole horn is pale and somewhat smooth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | These antlers and other bony horns are extensively employed in Europ<br>for the manufacture of handles for cutlery, umbrellas, and sticks, &c. Th<br>Gazetteers of Ratnagiri and Kánara in Bombay, and the Madras Manua<br>of Administration treating of Vizagapatam, contain accounts of the antler<br>of Samber and other deer, being employed locally in the manufacture of<br>small fancy articles, such as those mentioned above, but the industry seem<br>to be a very poor and unprofitable one.<br><i>Horns of the 2nd class</i> — Are employed principally in the manufacture of the manufacture of the manufacture of the section of the sectio |
|                 | facture of "horn " for the purposes of comb-making. The keratin, of which<br>the commercially valuable part is composed, is eminently suited to a number<br>of purposes, owing to its elasticity, flexibility, and toughness, together with<br>its physical property of softening under the application of heat, and it<br>capability while in this condition of being moulded and welded into various<br>forms under pressure. The horns of sheep and goats are whiter and more<br>transparent than those of other animals, and are, therefore, most valued for<br>comb-making purposes, while of the Indian horns, those of the arna but<br>falo (Bubalus ami) are the handsomest and best for more ornamental work<br>According to the authors of <i>Spons' Encyclopaedia</i> about one-fifth of the total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| -               | imports of horn into England are employed in comb-making, while a sma<br>portion is converted into shoe-horns, scoops, cattle-drenches, drinkin<br>cups, &c. The solid tips and the hoofs of cattle (which like horn consis<br>largely of keratin) are made into buttons.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| combs.<br>411   | In the preparation of horns for comb-making, &c, the following is th<br>process usually adopted :<br>"Horns which are to be manufactured are first thrown into water h<br>which means slight putrefaction is caused, ammonia is liberated, and th                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| Comb-making;,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                         | HORNS.          |
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| horn begins to soften; the softening is then continued by<br>acid bath, for a period of about two weeks. When suf<br>are cleaned and split into two parts by a circular saw.<br>introduced between heated plates, and the whole is subje<br>of several tons a square inch. The plate may bear devic<br>ing form, thus producing at once any desired effect. I h<br>be dyed black or brown by dipping it into a bath contai<br>tion bf mercury or lead salts, and rubbing on hydrosulp<br>or it may be mordanted in an iron bath and dyed by<br>markings are produced by immersing the horn in a bath<br>then in hydrochloric acid, thus forming white lines in the<br>born                                                                                                                                                                                                                                                                                                                                                                                                                                                          | fficiently soft, they<br>These slices are<br>octed to a pressure<br>ces, or be of vary-<br>ne horn may then<br>ining a weak solu-<br>hite of ammonia;<br>logwood. Fancy<br>of lead salt, and                                                                                                                                                                         | USES.<br>Combf. |
| horn.<br>V The manufacture of combs is by far the most import<br>horn. The laminatory character of the horn, its very<br>grain, and the raising up of the fibres by the use of the var<br>it very difficult to apply machinery in its conversion, and<br>of hand labour required helps to cause the proportionate<br>the manufactured article. The softened horn is first s<br>the direction of the grain; it is then warmed in hot wa<br>between cold iron plates, and pressed level. If the go<br>sequently stained, the slices are further placed between<br>and very strongly pressed, to reduce the thickness and of<br>ficial grain. The prepared slices are next stamped out by<br>to form as many combs as possible, of various sizes and<br>fully economize the material. The slices are again p<br>ened and ground, ready for cutting the teeth, which operative<br>by a • parting-engine,' or dye-stamping machine, in the<br>combs, and by circular saws in that of fine-toothed of<br><i>Encyclonagdia</i> .                                                                                                           | diversely running<br>rious tools, render<br>the large amount<br>ely high price of<br>plit lengthwise, in<br>iter, laid out flat,<br>ods are to be sub-<br>hot steel plates,<br>destroy the super-<br>cutters, arranged<br>shapes so as to<br>pressed, straight-<br>ation is performed<br>he case of coarse                                                           |                 |
| <i>Encyclopaedia.</i> )<br>The employment of this class of horn in India, like<br>is small and local, records only being maHe of specia<br>in Ratnagiri and Kánara in Bombay, and Vizagapatam<br>the lattiT place it is stated, '• ornamental articles are no<br>horn, but they have no sale in England, being surpassed<br>workmanship by articles of German manufacture " In<br><i>zetteer, XV.&gt;</i> (Kanara) the following passage occurs : "<br>cattle, deer, and bison horn, are made by some carpent<br>with considerable skill at Kumta, Honawar, Sid da pur<br>Sonda. The demand for the work is small, and in r<br>more than a few families. The horn is collected in the<br>of a horn varying from 4. annas to Ri. The article<br>jewel-boxes, combs, snuff-boxes, cups, handles for st<br>buttons, rings, and toys. A jewellery box costs about Ri<br>smal <sup>1</sup> snuff-box 2 to 4 annas. <sup>3</sup> Similarly, it is reported<br>"Fancy articles of Bison's horn are made by a few carpen<br>considerable skill at Vijaydurg, Maban, and Rajapur.<br>said to have been started some 200 years ago at Vijaydu | I horn industries<br>in Madras. Of<br>eatly executed in<br>in cheapness and<br>the <i>Bombay Ga</i> -<br>Fancy articles of<br>ers and <i>gudigars</i><br>, Bilgi, Sirsi, ard<br>no place employs<br>district, the price<br>s made are small<br>icks and knives,<br>5, and a comb or<br>from Ratnagiri:<br>tters' families with<br>The industry is<br>rg. The horn is |                 |
| imported in small quantities from Malabar and Cochin, t<br>from Ri to R2 according to size. The horn is heated<br>fire, and to make it malleable is softened with cocoa<br>The articles made, varying in price from R5 to R8, are<br>stands; snuff-boxes; cups for idols decorated with bulls,<br>combs; chains; handles for sticks; and different kin<br>animals. The demand for the work, perhaps the only<br>district, is very limited and the workers few and much ind<br>From the above extracts it will be seen that, with their                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | the price varying<br>lover a moderate<br>nut oil and wax*<br>e card trays; ink-<br>cobras, and deer;<br>nds of birds and<br>specialty in the<br>lebted.''                                                                                                                                                                                                            | •               |

From the above extracts it will be seen that, with their present deficient

| HORNS.                    | Trade in Horns.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| USES.<br>Combs.           | methods and want of machinery, the Natives of districts even in which the<br>industry is an old and well known one, cannot compete with the cheap<br>horn articles of European manufacture, now so easily obtained in every<br>bazdr, at least of the larger towns. A small quantity of horn is also<br>utilised in most parts of India by the <i>kangi-saz</i> or comb-maker, who em-<br>ploys, amongst other materials, the horn of the buffalo in the manufacture<br>of his wares. Mr. Hoey, in his description of this industry, as carried on in<br>Northern India, writes: "Buffalo horns of the description used for combs<br>are usually sold at R25 per 100. If a horn be a seer in weight it will make<br>20 combs, <i>viz</i> , ten 1st class combs, which sell wholesale at R3-8 per hundred,<br>and five 2nd class combs, which sell wholesale at R3-8 per hundred,<br>and five 3rd class combs, which sell wholesale at R3-8 per hundred,<br>and five 3rd class combs, which sell these combs at 1 anna each, first<br>quality, 9 pies each, second quality, 6 pies each, third quality." In a<br>further passage he writes that ebony combs are preferred by all classes, but<br>that they are too expensive for general use; and that, of other kinds, women<br>prefer horn combs, and men those made of wood. "This is so to such an<br>extent," he remarks, " that <i>Banana kanghis</i> (which are made with teeth on<br>both sides) are made of horn exclusively, and <i>mardana kanghis</i> (made with<br>teeth on one side only) are constructed of wood." Near Hugli, in Bengal,<br>a small trade also exists in locally-manufactured combs, some half a dozen<br>families being so employed. It is probable that throughout India, here<br>and there, a few comb-makers still practise their art, though it would<br>appear that the European-made combs are rapidly displacing those of<br>home manufacture.                                                                                                                                                                                                                                                                                         |
| TRADE.<br>Exports.<br>412 | Trade.—The export trade in horns is large and important and appears<br>to remain fairly stationary. During the past five years the total amount<br>has varied from 48,000 to 68,000 cwt., and the total value from 12 to<br>16 lakhsbof rupees. The average during that period was 58,568 cwt.,<br>value R 15,00,933 ; the minimum export was in 1886-87, 48,435 cwt., value<br>R12,27,082, and the maximum was in 1887-88, 68,018 cwt., value<br>R>i6,43,937. The countries which form the chief markets for Indian horns,<br>are France, the United Kingdom, and the Straits Settlements, but<br>returns shew a small though fairly steady trade with Belgium, Italy,<br>EgyP^ Germany, Austria, Ceylon, and China, named in order of import-<br>ance. The average amounts imported by these during the period under<br>consideration were, France, 26,253 <sup>c</sup> wt, value R7,33,528; United King-<br>dom, 25,205 cwt., value R5.72.624; Straits Settlements, 4,899 cwt., value<br>R 1,26,107-8; the others are unimportant, and need not be enumerated.<br>The provinces from which the horns thus exported are principally<br>obtained are Bombay, the North-West Provinces and Oudh, the Central<br>Provinces, the Panjáb, Bengal, and Madras, of which the first appears to be<br>the most important. Thus in the returns of the total quantities carried by<br>rail and river in 1886-87, it will be found that Bombay exported 10,531<br>maunds, the greater part of which went to its own seaport town; the North<br>West Provinces and Oudh, 7,859 cwt. ; the Central Provinces, 7,374, cwt.<br>the Panjab 5,223 cwt.; Bengal (excluding Calcutta) 3,570 cwt?, and<br>Madras (excluding Madras Ports) 3,387 cwt. By far the largest quantity<br>thus collected goes for exportation to Bombay; thus the average tota<br>exports from Indian ports during the four years under consideration were<br>from Bombay, 31,766 cwt.value R8,29,289; from Bengal, 14,328 cwt., valu<br>$\Re_3^*,5.374$ ; from Madras, 9,195 cwt., value R2.14.397; from Burma4,93<br>cwt., value R 1,34,070; from Sind, 466 cwt., value R3.702; and in every yea<br>the exports from these ports retained much the same relative pos |

| Indian species of the genus Equus. (J. Murray?)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HORSES.                          |
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| Agriculture and Revenue Depamnent for 1886-87 as follows: Madras<br>R17-12; Bombay R20-7; Sind Rio; Bengal R10-12; North-West Prov-<br>inces and Oudh R8; the Panjáb K4; the Central Provinces Rig-4; Berar<br>R15, and Assam R11-5.<br>The writer of the article on horns in <i>Spons' Encyclopaedia</i> records that<br>the approximate value in England of the different classes of horn, were<br>in 1879.' deer, East Indian, 40-120 s. a cwt.; buffalo, East Indian, 20-60 s.;<br>tips, East Indian (consisting of solid horn for the manufacture of buttons                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TRADE.                           |
| &c.,) 18-40 5.<br>IMPORTS FROM FOREIGN COUNTRIES AND RE-EXPORTS.—On review-<br>ing the trade returns of imports by sea it will be found that the quantity<br>thus annually received in India is a very fluctuating one. Thus in 1883-84,<br>2465 Owt. were imported; while in 1887-88, only 368 cwt. came into the<br>country. The average for the past five years has been 1,116 cwt., valued<br>at R62,oi4. The countries from which these have been principally obtained<br>are Ceylon, from which the average imports for the same period was 725<br>cwt., valued at R28,652; Zanzibar 283 cwt., valued at R35,645; and<br>Mozambique 37 cwt., valued at R4,507. The horns obtained from Eastern<br>Africa are thus evidently much more valuable than those from Ceylon.<br>The trade returns of re-exports shew that only a small proportion of<br>this import has been re-exported, at least as foreign merchandise, since the<br>average during the same period is found to be only 321 cwt., valued at<br>R38,022. The whole of the re-exports are shipped from Bombay, and<br>nearly all go to Hong-Kong, the average for the past five years being 296<br>cwt., value 1*37,683. In 1884-85 a small consignment was sent to Great<br>Britain, while in 1883-84, Aden, and in 1886-87 the Straits Settlements,<br>received 6 and 2 cwt., respectively. The greater part of the horns imported<br>by trans-frontier trade comes from Kashmir, but the quantity thus recorded<br>is small. In 1887-88 it amounted to 147 cwt., valued at R 1,973. There<br>is no record in the trade returns of any exports to trans-frontier Countries. | Imports ft<br>Re-exports.<br>413 |
| HORSES, ASSES, & MULES.<br>The Horse and its near allies, the several species of Ass and Zebra, form the<br>genus Equus of Linnaeus, fhey are all indigenous to various parts of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 414                              |
| Old World, though fossilised remains of an animal about the size of a fox or . sheep, but unmistakeably belonging to the genus Equus, have been found in the Eocenes of North America. They are very distinct in structure from other genera of Mammalia, and in the old systems of classification constituted a separate Natural Order under the name of MONODACTYLA or SOLIDUNGULA. Researches in comparative anatomy have, however, disclosed the fact that their structure, seemingly so singular and exceptional, is in reality nearly allied to that of the rhinoceros and tapir, a result which has been confirmed by numerous palxontological discoveries, and restorations of extinct species forming intermediate stages between a remote many-toed ancestor, and the present onet<>ed type. It is not proposed in this article to enter into the Anatomy, Physiology, and Pathology of the Horse and Ass, for accounts of which the reader is referred to the many works of authors who deal with veteiinary science. Nor is it necessary to discuss the extensive and complicated subject of G jvernment Horse Breeding in India, since the numerous and valuable reports issued on the subject are accessible to the public. The species of the genus which present features of economic interest are only two—Equus caballus, <i>Linn.</i> , The Horse; and H. asillUS, <i>Linn.</i> , the domestic Ass. Four species of as and three of zebra have, however, been described by naturalists. <i>via</i> . E. toenionus. <i>Heuglin</i> .                                                                                         |                                  |

and H. ashros, *Linn.*, the domestic Ass. Four species of ass and three of zeora have, however, been described by naturalists, *via.*, E. toeniopus, *Heuglin.*, the Wild Ass of Abyssinia; E. hemionus, *Pallas.*, the Kiang or Dzeggetai of the high tablelands of Tibet; E hemippus, *Geoff.*, the Syrian wild ass, and E. onager, *Pall.*, the Onager of Persia, the Panjab, Sind, and the desert of Cutch. The first of these is undoubtedly the ancestor of our domesticated animal, while the other three here here here severel Zeologicta reduced to one

animal, while the other three have been by several Zoologists reduced to one species. The zebras have by Hamilton Smith been separated as a genus

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| HORSBS.  | History of the Horse in India,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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|          | <ul> <li>Hyppotigris, but they only differ from the a9ses in their colouration, and one of them E. qilagga, Gmel., the Quag&amp;a, is intermediate between the 'zebras and true asses. The other two species ate E. burchelli, Gray; the DauW, and E zebra, Linn., the Mountain Zebra. All three species are natives of South Africa. Though there are thus seven distinct species, or species considered distinct by the majority of naturalists, they will all, at least in a state of captivity, breed with perfect freedom with any of the others. Thus the writen of the article "Horse " in the Encyclopaedia Britannica states that cases of fertile union are recorded between the horse and the quagga, the horse and the dauw, the domestic ass and the zebra, the domestic ass and the hemionus or Asiatic wild ass, the domestic ass and the dauw, the domestic ass and the zebra, and the dauw. As is well known, also, the horse and the ass, perhaps the two most widely distinct of the species, produce the mule, which in many useful qualities excels both its progenitors. These hybrids or mules do not breed inter se, and only very rarely nave instances been recorded of a fertile union between a female mule and a male horse or ass.</li> <li>Vern.—Ghora (g*dda — ass), (ghur-khur=Equus onager), HIND. 5 A** KIRGHIZ; Kudri (kalda**2iss), TAM.; Guramu [gardhi=zss], IEL.; Son, hnyet, myen, (mvaz^ass) BURM.; Asu, hya, aswa, furg, vag, vaji, ghotak, piti, SANS.; His dn (khamar =*a.ss), ARAB.; Asp, (ghour=E.qu/l3 onager), PERS.</li> <li>References.— Wallace, India in 1887, 127 f Darwin, Animals and Ph. under domestication, I., 49; Jerdon, Mam. of India, 236 ; 1st Yarkhand Mission Rep., 70 ; Lahore to Yarkhand, 135 ; Adams, Naturalist in Income, 579 ; UPER, Yammu arta nusammer, Sor; voyage of Joon rawgr henVa an Linschoten, Ed. 1885, I., 54 ; Ain-i-Akbari, Blochmann's Trans., I., 144, 196, 207 ; JL.</li> </ul> |
| HISTORY. | <ul> <li>132-139 216. 233. 250, 255; Gladwin's Trans., I., 144, 196, 207; II., 78, 95<sub>1</sub>* 116^136^177'; Spoils, Encyclop., 1098; Balfour, Cyclop., L, 188; II., 103; Morton, Cyclop. Agr., II., 7/; Inti. Agri. Gazette, 1887, s3i; Rep. of Agri. Dept.:—Madras, 1884-85, 10; 1885-86, 9,4f&gt;'\$ Bombay, 1885-86,44; 1886-87, App. xvi.; NW. P., 1882,52; Burma, 1887-88, 29; Rep. Exper. Farms;—Madras, 1884-85<sub>1</sub> 54 / Bombay Admin. Rep. : 1872-73,341; Gazetteers :—Panjdb ;—Rawalpindi, 85; Jhelam, n3, Dera Ghazi Khan, 86; Bombay,—IV., 24; V.9 28; VIII., 97,311; XII., 28; XVI., 21; XVII., 35;\XVII., Pt. I., 61; XXII., 37; Burma, I., tfS-Habitat, History, &amp;c.—The horse has been a domesticated animal from</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 415      | pre-historic times, which renders it difficult to determine its original habitat.<br>No aboriginal or truly wild horse is krlWn positively to exist, though<br>many authors assert that the wild horses of the East are not descendants<br>of escaped domestic horses, but are in reality of aboriginal origin. Thus<br>Prejevalski described in 1881 a wild horse found by him in the deserts of<br>Central Asia. It, of all others, appears to have the strongest claim to being<br>a genuine wild horse. In colour it is whitish grey, paler and whiter beneath<br>and reddish in the head, which is also large and heavy in proportion to the<br>small body. It approaches the ass and zebra in the structure of the tail<br>the hairs of which begin half way down from the base. The ears, how<br>ever, are horse-like, and it has warts on the hind, as well as on the fore<br>legs, which characteristics are sufficient to classify it as a true horse.<br>Intense heat and extreme cold appear to be equally well borne by the<br>horse, which readily becomes acclimatized and suited to the most diversis<br>fied surrounding conditions. Thus wild horses (horses which have hecom<br>wild from a state of domestication) are found in Siberia at lat. 56° N.<br>while, on the other hand, in Arabia, with its intense heat, the horse abound<br>in the highest state of perfection and with great powers of endurance.<br>There seems to be little doubt that all the varieties of horse, domesticate<br>and feral, existing at the present day, are descended from one common<br>stock, which Darwin, in his very interesting chapter on " Horses and Assess<br>( <i>Animals and Plants under Domestication</i> ), has proved to have been pro-<br>bably dun-coloured and more or less striped. In the Neolithic or Polishee<br>Stone Period, wild horses were certainly abundant in Europe, as is ev                                                       |

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Prehistoric Horses,

(J Murray.)

HISTORT.

HORSES.

denced by the discovery of theinremains, associated with those of men; and the rude representations of the animal on reindeer horns, &c, found in lake dwellings, tend to prove that the chase of the horse must have been one of the chief occupations of pfe-historic mart. Bones, and the rough etchings above alluded to, show that the horse of that period must have been a small, heavy animal, with shaggy hair, mane, and tail, and a large head.

That these horses were domesticated or partly domesticated in prehistoric times is proved by their remains having been found in the lake dwellings of Switzerland. It appears probable, however, that the greater number of breeds of horses now existing in Europe are not direct descendants of these European pre-historic races, but are derived from horses imported through Greece and Italy from Asia. These Asiatic ancestors were, on 'heir part, probably the outcome of a still earlier domestication, accompanied by long continued attention to breeding and selection, which resulted in a great improvement in the qualities which render the animal so valuable to man. As these qualities have always been the points towards the improvement of which the breeding of horses has been directed. all existing breeds present some peculiar character, specially fitting them for their surroundings and work. The process of artificial selection has thus resulted in the production of such various types as the English thorough-bred, which may be called a highly perfected gallopping machine, the English draught horse, with its enormous power and working capacity, and the little Shetland, or to take an Indian example, the Manipur pony, so admirably fitted by its small size, strength, and powers of endurance, for work in mountainous countries. Horse-breeding, or the artificial selection of stallions and mares having certain qualities or peculiarities which it is desired to perpetuate, together with careful rearing of the foal, is historically of very ancient date. Thus Solomon imported horses for breeding purposes from Egypt at high prices, and the Arabs have for centuries been extremely careful in their breeding operations, and have takin every pre-caution to keep certain strains of blood pure and unmixed. There is abundant philological evidence that the horse was known to the Arvans before the period of their dispersion, and it appears probable that the Semetic peoples as a whole ai# indebted for the horse to the lands of Iran. Thus the earliest Egyptian monumental record of the animal dates from about the eighteenth century B.C. the earliest Hebrew reference is not older, and Hehn has pointed out that literature affords no trace of the horse in Arabia before the fifth century B.C. The present Indian breeds of horses have probably been derived, for the most part, from Arabian, Persian, and Turkoman ancestors, and present, as in other countries, many distinct races. They are, as a rule, small, lightly built, and possess many of the characters of the Arab. As the horse is never employed in India for heavy draught work, like the dray or farm horse of England, no simi-The question of the origin of existing lar strong, heavy breed exists. races, owing to the want of records and literature on the subject, is one of extreme difficulty. There seems little doubt, however, from the earliest reports we possess that the Arabian horse in this country, as in Europe, has always been the mainstay of breeders. Thus John van Linschoten, in the account of his travels in India in the sixteenth century, mentions that, "out of Arabia diverse goodly horses are imported, that are excellent for breeding," and Abul Fazl, in a long and accurate description of Akbar's stables written about the end of the same century, writes : " His Majesty is very fond of horses, because he believes them to be of great importance in the three branches of the government, and for expeditions of conquest, and because he sees in them a means of avoiding much inconvenience. Merchants bring to court good horses from 'Irdq i 'Arab and 'Ir£q i 'Ajam, from

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| HORSES.                    | Breeds of Indian Horses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>HISTORY.</b>            | Turkey. Turkestan, Badakhshán, Shirwán, Quirghiz, Tibet, Kashmír, and<br>other countries. Droves after droves arrive from Turán and Irán, and there<br>are now-a-days twelve thousand in the stables of His Majesty. Skifful expe-<br>rienced men have paid much attention to the breeding of this sensible ani-<br>mal, many of whose habits resemble those of man ; and after a short time<br>Hindustan ranked higher in this respect than Arabia, whilst many Indian<br>horses cannot be distinguished from Arabs or from Trafq breed* There<br>are many fine horses bred in every part of the country, but those from Cutcn<br>excel, being equal to Arabs. It is said that a long time ago an Arab snip<br>was wrecked and driven to the shore of Cutch ; and that it had some choice<br>horses from which, according to the general belief, the breed of that country<br>originated. In the Pan jab horses are bred resembling Traqis, especially be-<br>tween the Indus and the Bahat (Jhelum); they go by the name of $S^{*thjf}$<br>(or <i>Satajift</i> "so also in the district of Pati Haibatpar" (near Moonuk),<br>"Bajwarah, Tahirah" (Patiala), "in the Siibah of Agra, Mewát, and in<br>the Sabah of Ajmir where the horses have the name of <i>Pachwariya</i> . In the<br>northern mountainous district of Hindustan, a kind of small but strong<br>horse is bred, which is called <i>tuft inar</i> , they are strong and powerful."<br>The writer then goes on to eulogise the efficient means taken by the Emperor<br>to secure good breeding, from which and many other passages it is evident<br>that Akbar wat not only a keen admirer of horses, but a careful and com-<br>petent horse-breeder, and it seems certain that the general breed of horses<br>in India must have considerably improved during his reign. In his further<br>detailed description of the various provinces of the Emperor's territory,<br>Abul Fazl again comments on the fine breeds produced in Cutch, Patf,<br>Haibatpur, Bajwarah, Taharah, Agra, Mewat, and Aimir, and also men-<br>tions the horses of Delhi as being good, those of Lahore as resembling<br>'Iraqis and very fine, those of Kashmir as small, hardy, |
| BREED OF<br>HORSES.<br>416 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                            | and Sikhs rendered almost unavoidable. Up to the beginning of the nineteenth century, several horse fairs were periodically held in Rajputana, especially those of Bhalotra and Poshkuf, to which the horses of Cutch and Kaihiawar, the Lakhi jungle, and Mult an were brought in great numbers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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| Breeds of Indian Horses. (J. Mu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | urray) HORSES.                                                                                                                                                                                                                                                                                                                                                                                                    |
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| Valuable horses were then bred also on the western frontier, on th<br>those of Rafdurro being especially esteemed. But with the conquest<br>British the steeds of Rarduiro, Cutch, and Lakhi, became almost<br>and the horses from the west of India were carried to the Sikhs. T<br>pression of the predatory system, which had been such a large sourc<br>mand* lessened the supply, and the superior Lakhi and Cutch breeds<br>for centuries were famous, became almost if not altogether extinct. I<br>sible, also, that the demands of the British for a larger class of animal t<br>country naturally produced, led to a system, at least in some cases, of<br>cial breeding, in which size was the object mainly aimed at, an objec<br>resulted in the deterioration of the original small, hardy breed, and th<br>duc' ion of badly-formed and weedy animals. Within recent years, he<br>the constant endeavours of the Government to improve the breeds of<br>horses, by importing stallions which possess in a marked degree th<br>ties wanting in the country-bred mare, and by encouraging breeding<br>part of the zamindars, have resulted in great improvements in the<br>carrying powers and endurance of the country-bred of the present of<br><i>Panjdb.</i> —Horse-breeding, in this, once upon a time the chief pr<br>province of India, has greatly fallen off, owing to several reasons,<br>at the time of the annexation, many of the best brood-mares were with<br>extensive demands were made on the province both for horses and<br>during the mutiny; and breeding from mares in the ranks," a system<br>carried on by the Sikhs, has, under British Government, "been<br>owing to the necessity of every horse in a regiment being always re<br>service. Owing to the last cause many well-bred and tractable<br>which would have been invaluable for brood purposes, have been los<br>province. The best brood-mares are probably those in the Rawa<br>Jhelam, Gujerat,Gugaira, and Lahore districts, and many ver<br>animals are also to be found in the frontier districts, such as<br>Kohat, Dera Ismail Khan, and Dera Ghazi Khan. The average I<br>country-bred is small, but fairly well-bre | ts of the<br>extinct,<br>The sup-<br>ce of de-<br>s, which<br>It is pos-<br>than the<br>of artifi-<br>ct which<br>the pro-<br>nowever,<br>f Indian<br>ne quali-<br>ig on the<br>weight-<br>day.<br>roducing<br>. Thus<br>hdrawn;<br>d mares<br>a always<br>stopped<br>eady for<br>e mares,<br>st to the<br>al Pindi,<br>ry good<br>Bunnu,<br>Panjábi<br>owers of<br>ernment<br>ed, both<br>ict alone<br>nares, of |

The horses of the Jhelam district have long been held in high esteem, especially those of the Dhan. The Gazetteer of the district contains the following interesting paragraph regarding them: "In former days the greater part of the Sikh cavalry was horsed from the Dhanni plains north of the Salt Range, and even now large numbers of remounts are drawn thence by the British Army; but the fall of the rich Sikh chiefs has removed the incentive for breeding large and powerful horses, such as the native gentleman delights in. Although the Dhan is best known for its horse-breeding, yet very good animals are to be found all over the district. Some of them are fast, and nearly all remarkably enduring and able to go over the stoniest ground without shoes. It may be doubted whether the Dhani and Talagong breeds are not deteriorating. Owing to the spread of cultivation and other causes the animals are allowed much less liberty than formerly, and the method of tethering them up is very bad." In 1884 there were eight Government horse stallions, and seven donkey stallions in the district, with 263 brood-marw branded for horse-breeding, and 109 for mule-breeding. The Biloch mares of the Dera Ghazi Khan district are famous for their endurance, some also being very handsome, and the class

horse stallions and 52 donkey stallions. The mules thus bred in Rawal Pindi are perhaps the best procurable for artillery purposes in India.

| HORSES.                                         | Bombay Hoses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| HORSES.<br>BREEDS.<br>Punjab.<br>Bombay.<br>418 | Bombay Hoses.<br>of remount obtained out of them by Government stallions promises to be a<br>very good one. There were twenty-two of the latter in the district in i8»4»<br>and nine stallion donkeys.<br><i>Bombay.</i> —As above mentioned in recounting the history of <sup>t</sup> ^ e <sup>n0</sup> JC<br>in India, the horses of CUTCH were at onetime perhaps the best bred in the<br>country. With the increased ease of importing horses from Arabia, <sup>p</sup> * ? <sup>1</sup> ^J<br>and Australia, however, along with the reasons influencing horse-breeding<br>incident on the British successes over the Mahrattas and Sikhs, the value<br>of the breed has much declined. The Cutch horse is generally a little over<br>14 hands, well made, spirited, showy in action with clean limbs and good<br>bone, thin long neck, large head, outstanding ram-like brow, and staal<br>ears <i>{Cutch Gazetteer}</i> . His chief defects are the length of his cannon bone,<br>his ugly heavy brow, and bad temper. As in other districts attempts nave<br>been made by the introduction of Government stallions to improve the<br>breed, but up to date seemingly with indifferent success.<br>The Kathiawar breed was also a famous one, for many centuries, and<br>is closely allied to the former ; indeed, the Persian name applied to the rate<br><i>vis., Kachhi</i> (Cutchi) would imply a common origin. In former days in<br>was the custom of the <i>Subahdárs</i> of Ahmadabad and the <i>Faujdárs</i> of |
|                                                 | was the custom of the Subahdars of Ahmadabad and the Paujaars J<br>Janágad to send presents of horses of this breed to the Emperor. The bes<br>horses of the true Kathf or Káthiawár type are found even to the presen<br>day on the shores of the Ran, and since in former times, the Arabs imported<br>for the imperial stables were landed at Verayal, Somn&th-Patan, Dm o<br>Surat, it appears probable that the superiority of the breed is due to a<br>Arab strain then introduced, the Kdthis having availed themselves of the<br>services of these Arab stallions on their way through the province. <sup>*</sup> R<br>breed, however, like many others of the old Indian country-bred, <sup>*</sup> sa<br>apparently fallen off greatly during the past century. The best h <sup>or</sup> ?<br>breeding region in the district 19 said, in the Gazetteer, to be Panchal, in ti<br>heart of the province, containing as it does every requirement essentia<br>to successful breeding, <i>vis.</i> , favourable soil for the formation of the fee<br>bitty ground for the development of muscle, plenty of good fodder an                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                 | running water, and a hot, dry climate. Thd^uthor of the Gazetteer further remarks: "In spite of neglect, confining the* young stock, and want of calin the choice of stallions, handsome specimens of the Ka*th breed may st be found. The peculiarities of the animal are that it is generally undersized and small-boned; its distinctive marks are a black cross down the bar and black bars on the Ieg9, the colour of the coat varying through every shade of dun. A well-bred Kithi is teachable and honest, free from vie full of spirit, and wonderfully lasting and hardy.*' Mares are most esteem by native breeders, as the horses are noted screamers, and are consequen not liked by the purchaser. The endeavours of Government to improve the breed have not as yet met with marked success, owing to the fact that the success of the success.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                 | Kdthis have shown themselves averse to showing their best mares, and v<br>very rarely sell a first-rate animal. The animal varies greatly in price,<br>much as «3,000 being still paid, according to the Gazetteer, for a horse of<br>best blood, while a serviceable, sound, and good-looking nag of from U<br>144 hands may be secured for from Rioo to R300. Considerable numb<br>of Kathi horses are kept in Ahmedabad, and as that district is one of<br>best for horse-breeding in the Presidency, it has attracted the special att<br>tion of Government, and appears likely to furnish good remounts.<br>The Baimthadi or Deccan horse is the remaining special breed<br>country-bred in Bombay, and probably, like the others, owes much<br>foreign blood arising from Arabian retrision and Turki sires. The fi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

, )1 to foreign blood, arising from Arabian, rtrsian, and Turki sires. The finest specimens of the breed are reared on the banks of the Bhima and Uira in Poona and Ahmadnagar, but, as in the case of other districts of Bombay,

| Ponies of the Himalayan Regions.(J. Murray.)HORSES.well-bred animals are neither so common, nor is the general breed so good as<br>in former times. The \u00ed l-bred Deccan horse is of middle size (rarely over<br>14-2 hands high), strong, rather handsome, generally of a dark bay colour<br>with black legs, and has the fine limbs, broad forchead, and much of the<br>docility and endurance of the Arab. The great mart for this animal is<br>malligeam, about 25 miles from Ganga Kheir, on the Godavery. This<br>breed is certainly one of the best in India, and is deservedly held in high<br>esteem, a regard which is fully warranted, when the long marches of the<br>Mahratta and Pindari horsemen, mounted on Deccan and Kathi horses,<br>are remembered. Government, consequently, as in other places, is at<br>present making great endeavours to encourage the development of the<br>breed. The ponies of the same district are also much valued on account<br>of abric strength, endurance, and frequently surprising speed.<br>The Deccan<br>pony was much more bred, however, 30 years ago before the days of rail-<br>ways when he was of great value for carrying malis, than now. They are now<br>principally in demand as hacks and <i>longd</i> ponies, and a good one will<br>fetch RISO to R200. The Deccan ipony is thick-set, short-legged, and<br>hardy, varies from 12 to 13% hands or a little more in height, and is gener-<br>ally bay, brown, or cheanut, seldom grey, and still less often dun. Of all the<br>Deccan breed the best pony is the Dhangar or Khildri. They were ge-<br>merally hough to be a special breed, but the general belief of authorities in<br>the present day is that their superior excellence is due to the D hangar's<br>practice of castrating them. A small but hardy breed of ponies is also raised<br>by the Thildris, a tribe of wandering herdsmen chiefly inhabiting the west of<br>Khándesh. Dhárwar in the Karn&tak was also once famous for its breed<br>of ponies runni                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | well-bred animals are neither so common, nor is the general breed so good as<br>in former times. 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                                                                                                                                                               | Murray.)   HORSES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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The ponies, except the yearlings, which are housed, are kept out all<br>winter, and live on the roots of stunted bushes or any other nourishment<br>they can pick up after scraping away the overlying snow.<br>The YARKANO pony is a breed that is raised in great numbers all over<br>it« native country, and is distinct from, though it very much resembles, the<br>Yabu of Afghanistan. Its chief points are short or medium height, round                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | in former times. 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All these ponies of the<br>Karndtak were much employed in the Afghan campaign of<br>Abyssinian campaign of 1867.68, and the Afghan campaign of<br>Abyssinian campaign of 1867.68, and the Afghan campaign<br>and on each occasion their numbers suffered considerable dimi<br><i>Ponies of the Himdlayan Regions</i> .—Several distinct br<br>the North of India and adjoining territories, all of which are vz<br>to their powers of endurance, their weight-carrying capabili<br>sure-footedness. The | cd so good as<br>(rarely over<br>k bay colour<br>much of the<br>is animal is<br>avery. This<br>held in high<br>arches of the<br>athi horses,<br>blaces, is at<br>ment of the<br>d on account<br>The Deccan<br>days of rail-<br>They are now<br>bod one will<br>-legged, and<br>and is gener-<br>n. Of all the<br>ney were ge-<br>authorities in<br>D hangar's<br>is also raised<br>g the west of<br>for its breed<br>deteriorated<br>ds, often ill-<br>Deccan and<br>1856-57, the<br>of 1879-80,<br>nution.<br>eds occur in<br>luable owing<br>ies and their<br>cts adjoining<br>ses. It is of<br>r 13 to 13^<br>teemed than<br>ongly made,<br>ard-mouthed<br>ble in hilly<br>s little if any<br>e kept out all<br>nourishment<br>bers all over<br>sembles, the<br>eight, round<br>its general<br>ke the ghunt |

| HORSES.                          | Ponies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BREEDS.<br>Himalayan<br>Regions. | wealthy inhabitants. The pony in Yarkand, unlike that in India, is not<br>only employed under the saddle or pack, but is also used in the ploughf<br>and in harness. The natives have distinctive names for the several<br>colours of pony, and have preferences for certain sorts, " <i>tunk</i> " or chesnut<br>being considered the best and most hardy. At the time of the Mission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Kashmir.<br>422                  | <sup>m</sup> 1873, <sup>m</sup> price varied from R40 to R150.<br>The KASHMIR pony has long been known and appreciated foT pack<br>and riding purposes in the hills. Drew mentions those of Baltist&n as<br>being particularly good, writing—° They stand about 12*3 or 13 hands<br>high; for their size they are rather large boned; they are compact in<br>make; they have a broad chest, a deep shoulder, a well-iormed barrel well<br>ribbed up, and good hind quarters, and a small, well-shaped head. T <sup>ne</sup> X<br>are good at hill climbing and at polo they are very active; they are ot<br>good heart, going long without giving in."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Bhutia.<br><b>423</b>            | The BHUTIA pony is a strong-boned, powerful, and very useful, hardy breed, largely employed as a hill pony in North-Eastern India. It is larger                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Burma.<br><b>424</b>             | than those of the more Western Himalaya, reaching a height of 14 hands.<br>BURMA.—The ponies of Burma, which are small, hardy, and exceedingly<br>tractable, are said to be all importations from the Shan States, from<br>whence large numbers are exported to Burma every year. They are,<br>however, generally known as Pegu ponies, presumably because they are<br>exported thence to India. In Burma they are generally employed for<br>drawing carriages, which, however, are only used in towns with roads.<br>Their characteristic pace is an unbroken run, in which the shoulders seem<br>to roll from side to side. A few of the officials and richer people ride                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                  | to roll from side to side. A few of the officials and richer people, ride<br>and the common people are all fond of pony-racing, not because they ride<br>or are fond of horses, but because a race meeting affords them an oppor<br>tunity of indulging their inveterate gambling propensities. About 100<br>are exported to India and the Straits yearly, where they are valued fo<br>their wonderful weight-carrying and enduring powers, and make good har<br>ness ponies. Burman stallions have been introduced into Ahmadnaga<br>and Poona with the view of improving the breed of Deccan ponies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Manlpur.<br>425                  | The MANIPUR pony is generally considered the best of all Indian<br>breeds under 13 hands. It is a small, mostly dun-coloured, animal, rarely<br>exceeding 12 hands in height, but possessed of wonderful powers of endu-<br>rance and weight-carrying capabilities. It is probable, however, that the<br>breed has deteriorated since the beginning of this century, at which tim<br>the Burmans, during their invasion of the country, made every endeavou<br>to exterminate the ponies which gave such powerful assistance in the hi-<br>warfare of the Manipuris. The Manipuris who, at that time took refug<br>in Kachar (many of whom have since settled there), withdrew with then<br>in their flight, as many of the ponies as possible. From that stock ha-<br>been derived the Manipuri pony as met with in India, but the Cacha<br>Manipuri is a very much inferior animal to the more carefully bred pon-<br>in Manipur itself. In Manipur the strictest system of protection again<br>inter-breeding is followed. The Maharaja allows no pony to leave ^th<br>State, and appropriates the best colts and fillies for his own stables, hence<br>the produce of his stud is extremely good. The ponies of the gener-<br>inhabitants, however, are allowed to roam the country in flocks, are ver-<br>much left to themselves, and uncared for, and Dr. Brown, in the annu-<br>report for 1872, lamented the fact that the general breed was deterioratin<br>In 1839 Government sent one Arab stallion and eight stud-bred mar<br>to the then regent, Nur Sing, but they and their descendants have con-<br>pletely died out, and seem to have left no trace of their strain in the prese-<br>breed. Before the Burman invasion at the beginning of this century, the |

| Foreign Breeds of Horses. ( <b>7</b> . Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | HORSES.                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| traffic in ponies between Manipur and that country formed a large and<br>important trade, so it is probable that the Bur man and Manipur breeds<br>are closely allied, though now in many points dissimilar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BREEDS,                          |
| FOREIGN BREEDS.—Besides these different breeds of Indian horses<br>and ponies, many foreign breeds are yearly imported in large quantities, of<br>which the most important are Australians, New Zealand horses, Arabs,<br>Persians, Gulf Arabs (out of Persian mares by Arab horses), Turkomans,<br>Cape horses, and Afgháns or Kdbulis. A few English horses are also an-<br>nually imported for stud purposes, principally thorough-breds, and Norfolk<br>Trotters, the latter of which are extremely popular with native breeders.<br>As an outcome of the large and general importation of these different<br>brteds, the foal at present reared by the zamindar contains a mixture of<br>many bloods, with the natural consequence that the old characteristic<br>breeds of various parts of the country are dying out. For accounts of the<br>results of this cross-breeding, and the relative values of the English<br>thorough-bred, Norfolk Trotter, Arab, or Australian as a sire, the reader<br>is referred to the numerous and valuable Government Reports on horse-<br>breeding.                                                                                                                                                                                                                                                                                                                                                                      | Foreign.<br>426                  |
| Domestic Asses exist in all parts of India, and are largely employ-<br>ed as beasts of burden, especially by the <i>Dhobis</i> or washermen, potters,<br>and tinkers. As a rule the Indian donkey is badly cared for, and ab-<br>solutely no attention is paid to its breeding, with the natural consequence<br>that it is small and unfit for saddle work. It is, however, cheap (costing<br>from R15 to R50), hardy, and readily picks up a sustenance from the<br>most unlikely ground, and consequently forms a valuable pack animal for<br>the poorer classes of itinerary merchants, such as those above enumerated.<br>A specially fine breed occurs in Kathidwar, of which the Hdlar or Jhalavdd<br>white variety is one of the strongest and largest. The Bhujias, who come<br>down from the higher Himálaya to seek employment during winter at<br>Simla and other hill stations, bring with them a very small, dark or almost<br>black donkey, with long shaggy hair. These appear to be useful animals<br>for load-carrying, but as they are not much larger than a good sized goat,<br>the <u>y</u> can only carry small loads.<br>The donkey stallions employed by the Government in mule-breeding<br>are not country-bred, but of the much more valuable Arab, Persian, Italian,<br>and Spanish breeds, which may cost as much as R300.                                                                                                             | ASSES.<br>427                    |
| Mule-breeding has been very extensively carried out by the Govern-<br>ment, since large numbers are required for use with transport and moun-<br>tain artillery. Considerable difficulty is, however, experienced in many<br>parts of the country in inducing the zamindar to employ his mares for mule-<br>breeding purposes, owing to the fact that rearing mules is considered<br>a degrading occupation. With good prices and every encouragement from<br>those in authority, this objection is, however, beginning to lose its force, and<br>large operations are now conducted, especially in the Rawalpindi and<br>Jhelam districts of the Pan Jab. An interesting paper on mules was re-<br>cently read by Mr. J. A. Steel, A.V.D., before the Bombay Natural<br>History Society, in which he contended that mules should be obtained for<br>Government by importation from abroad rather than by mule-breeding<br>in districts where valuable races of horses are bred, but that it might be<br>encouraged in places such as Madras, Bengal, and Burma, which supply<br>no horses and few ponies. Of late years a considerable number of mules<br>have from time to time been imported by the Government from Persia,<br>the supply from India not having proved sufficient for the demand. This<br>demand has steadily increased, and will in all probability continue to do<br>so, owing to the superiority of the mule as a strong, hardy, surefooted, | MULE-<br>BREEDING.<br><b>428</b> |

| HORSES.                                           | Trade in Horses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HORSE-FOOD.<br>429                                | and healthy baggage animal, suited for transport purposes in almost<br>any description of country.<br>Food and Fodder of Horses, &c—See articles on Fodder, Vol. III<br>407-487, Gram, II., 274, Madras Horse Gram, III., 175, Barley, p. 77;<br>also Oats, Maize, and Fodder in Appendix.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| HIDE.                                             | Hide.—For horse hides and their special qualities see articles on <hide9,< td=""></hide9,<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 430<br>hair.<br>431                               | also Leather.<br>Hair—Is apparently little employed in India, nor does the Indian<br>article form part of the commercial supply in Europe. The hair employed<br>in trade is derived from the mane and tail only. In Europe the long<br>hair is used chiefly in making hair-cloth for purposes of upholstery^&c,<br>also for the manufacture of straining-bags and cloths, seives, plumes,<br>wigs, fishing-lines, and ropes. The short hair is curled for stuffing seats,<br>mattresses, &c, while medium coarse hair is sometimes used in brushes<br>( <i>Spons' Encyclopaedia</i> ). The market price varies from 4 <sup>^</sup> . to 45. a pound in<br>England, depending on the cleanness, quality, and length of the hair.<br>Horse-hair is employed by the natives of parts of India in ornamental<br>embroidery of leather work, and for the manufacture of the commoner<br>sorts of fly flapper or "chauhrt."                                                                                                                                                                                                                                 |
| FOOD.<br>Flesh.<br><b>432</b>                     | Food.—The FLESH of the horse is largely utilised as food by many<br>castes in various parts of the country, and is considered specially good by<br>the hill tribes of Northern India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 432<br>MEDICINE.<br>Milk.<br>433<br>Urine.<br>434 | Medicine.—The MILK both of mares and she-asses is recommended<br>in Sanskrit literature, as slightly acidulous, easily digested, and specially<br>suitable for the dietary of dyspeptics and convalescents. U. C. Dutt, in<br>his <i>Hindu Materia Medic a</i> , also mentions the URINE of the horse as being<br>employed medicinally by Hindu practitioners, but does not describe its<br>supposed vivtues.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| DOMESTIC<br>& SACRED<br>USES.<br>435              | Domestic & Sacred Uses.—Horse sacrifice is considered one of the<br>most efficacious of propitiatory offerings in Hindu religion. Thus in the<br>ordinances of Manuit is laid down as one of the methods of purification or<br>the part of one of the Hindu castes, alter unintentionally slaying a Brahman<br>Ancient Sanskrit literature relates that the gods killed a man for their<br>victim, but from the man the part fit for sacrifice went out and entered<br>a horse, after which the horse became an animal fit for sacrifice. In<br>like manner the ox, sheep, and goat in turn became sacrificial animals<br>and according to Hindu belief the specially sacrificial part remained longes<br>in the last. Sir Monier Williams, commenting on this subject, writes<br>"The Asva medha or * horse sacrifice' was a very ancient ceremony<br>hymns 162 and 163 in Mandala I of the Rigveda being used at the rite<br>It was regarded as the chief of all animal sacrifices, and in later times it<br>efficacy was so exaggerated that a hundred horjfe-sacrifices entitled th<br>sacrificer to displace Indra from the dominion of heaven." |
| TRADE.<br>436<br>Imports.                         | Trade.—A large and important import of horses takes place annually<br>principally of Australians (called "Waters"), Persians, and Gulf Arabs, and<br>Cape Horses, from which the remounts for British Cavalry, and Horse and<br>Field Artillery are derived. The number of animals thus brought int<br>the country has steadily increased up to 1887-88, in which year there was<br>a slight falling-off. Thus the average number imported during the five<br>years ending 1882-83 was 4,22 <sup>^</sup> value R 14,90,458, while in the perio<br>ending 1887-88 the average was 0I202, valued at 1*23,14,148. The count<br>tries which form the source of supply are Australia, Persia, Turkey in<br>Asia, Cape Colony, and the United Kingdom, and to a very small exter<br>Ceylon, South America, Arabia, Austria, Italy, and Aden. As an exam                                                                                                                                                                                                                                                                                                     |

|                |    |   |   |   |   |   | N | lumber. | Value.<br>R |
|----------------|----|---|---|---|---|---|---|---------|-------------|
| Australia      | •  |   | • | • | • | • | • | 3,924   | 14.51,300   |
| Persia •       | •  |   | • | • | • | • | • | 1,589   | 5,32,600    |
| Furkey in Asia |    |   |   | • | • | • |   | 946     | 3,35,400    |
| Cape Colony    |    | • | • | • | • | • |   | 150     | 30,000      |
| United Kingdo  | om | • | • | • | • | • | • | 33      | 1,27,520    |
| Ceylon • a     | •  |   | • |   | • | • | + | 10      | 3,135       |
| South Americ   | a  | • |   | • |   | • | • | 6       | 3,500       |
| Arabia •       | •  |   | • |   | • | • |   | 5       | 1,250       |
| Austria •      | •  |   | • | • | • |   |   | 5       | 2,000       |
| Italy .        | •  |   | • | • | • |   |   | 2       | 5.000       |
| Aden .         |    | • | • | • | • | • |   | I       | 700         |

Trade in Horses; The Horse-radish. (J. Murrav.) HORSE-RADISH.

Of the total number, Bengal imported 2,591, value R 10,41,500; Bombay 2,705, value R 10,31,270; Sind 28, value R 13,000; Madras 1,346, value R4,06,235; Burma 1, value R400.

The re-exports are small and unimportant, the average during the same period having been 98 horses, value R 36,801 ; a considerable fallingoff from the average for the preceding five years, which was 158 horses, value £52\*784. The countries receiving these re-exports were the United Kingdom, Ceylon, Straits Settlements, Zanzibar, and Australia, the former country importing those of greatest value. Thus in 1887-88, though the total export of foreign horses to the United Kingdom was only 10, the value was Ri7,000, or anaverage of RIJOO per horse. The four chief ports of India all take part in this re-export trade, Calcutta having the chief share. While the exportation of foreign horses shows a falling off during the past five years, that of country-breds, though small, has markedly increased during the same period. Thus the average for the period under consideration was 670 horses, value R 1,14,442 in comparison with 362 horses, value was 670 horses, value K 1,14,442 in comparison with 562 horses, value  $\pounds 51.858$  for the five years ending 1882-83. Burma appears to have the largest share of this export trade, having in 1887-88 shipped 510 horses, value R88,I3I, out of a total of 770, value Ri,43,924. In the same year Calcutta exported 207 horses, value ^52,673; Madras 51, value 1\*2,870; and Bombay 2, value R250. The chief importing countries in the same year were the Straits Settlements with 717, value R 1,38,834; Ceylon with 43, value R2,540, and China with 1, value R 1,000, while other countries imported an aggregate of 9, value R 1,550.

It would seem, from these statistics, that the only demand for countrybreds is for low priced, and probably small, pcnies, a demand which is principally met by trie supply from Burma.

Horse chesnut, see iEsculus Hippocastanum, Linn. / Vol. I., 127.

Horse gram, see Dolichos biflorus, Linn.; Vol. III., 175-

Horse-radish, or Cochlearia Armoracia, Linn./ CRUCIFEIUE.

A perennial plant, common in moist places in Europe, and occasionally grown as a vegetable in India. Its root is officinal in the Indian Pharmacopoeia, and is imported for use. Internally it is stimulant, sudorific, and diuretic; externally applied, flpitant and vesicant; when chewed it is sialagogue. It is prescribed for atonic, dropsical, and rheumatic affections, scurvy, &c, internally and locally, chewed in substance, for toothache, and as a stimulant embrocation or cataplasm in paralysis, &c. (Indian Pharmacopoeia, 23).

**Re-exports.** 

Exports.

437

TRADE.

| USE-BU<br>Timbe | <b>ILDING</b> Timbers used in <b>Ers.</b> | House-building.                                                               |
|-----------------|-------------------------------------------|-------------------------------------------------------------------------------|
|                 | Horse-radish Tree, see Moringa            | pterygosperma, Gartn.; MORINGE*                                               |
|                 | Horse-tails, see Equisetum, VOL.          | III., 252. L                                                                  |
| 438             |                                           | For a description of their respective is referred to the separate articles of |
| 439             | House-Building, T                         | Timbers used for—                                                             |
|                 | Abies Webbiana.                           | Cinnamomum sp. (C.? Parth                                                     |
|                 | Acacia Catechu.                           | noxylon. Meissn.).                                                            |
|                 | A. dealbata.                              | Cocos nucifera.                                                               |
|                 | A. ferruginea.                            | Cordia Rothii.                                                                |
|                 | Acrocarpus frasdnifolius.                 | Cratoxylon neriifolium.                                                       |
|                 | Adenanthera pavonina.                     | Cupressus torulosa.                                                           |
|                 | Adina sessilifolia.                       | Cynometra ramiflora.                                                          |
|                 | £isculus indica.                          | Dalbergia lanceolaria.                                                        |
|                 | Afzelia bijuga.                           | D. paniculate.                                                                |
|                 | Albizzia amara.                           | D. Ŝissoo.                                                                    |
|                 | A. Lebbek.                                | Daphnidium elongatum.                                                         |
|                 | A. procera.                               | Dendrocalamus strictus.                                                       |
|                 | A. stipulate.                             | Dillenia indica.                                                              |
|                 | Alseodaphne sp.                           | D. pentegyna.                                                                 |
|                 | Altingia excelsa.                         | D. retusa.                                                                    |
|                 | Amoora cucullate.                         | Diospyros ehretioides.                                                        |
|                 | Anogeissus acuminate.                     | D. melanoxylon.                                                               |
|                 | Anthocephalus Cadamba.                    | Dipterocarpus alatus.                                                         |
|                 | Artocarpfls hirsute.                      | D. tuberculatus.                                                              |
|                 | Averrhoa Carambola.                       | D. turbinatus.                                                                |
|                 | Bambusa Balcooa.                          | D. zeylanicus.                                                                |
|                 | Barringtonia racemosa.                    | Dolichandrone falcate.                                                        |
|                 | Bassia latifolia.                         | D. stipulate.                                                                 |
|                 | Bauhinia purpurea.                        | Doona zeylanica.                                                              |
|                 | Beilschmiedia Roxburghiana.               | Ehretia laevis.                                                               |
|                 | Betula Bhojpattra.                        | £. Wallichiana.                                                               |
|                 | Bischofia javanica.                       | Elaeocarpus lanceaefoltus•                                                    |
|                 | Briedelia montana.                        | Engelhardtia spicata.                                                         |
|                 | B. retusa.                                | Eucalyptus Globulus.                                                          |
|                 | Bruguiera gymnorhiza.                     | Eugenia Jambolana.                                                            |
|                 | Buchanania latifolia.                     | E. operculata, Roxb.; var.                                                    |
|                 | Bucklandia populnea.                      | operculata, proper.                                                           |
|                 | Calophyllum spectabile.                   | E. tetragona.                                                                 |
|                 | C. tomentosum.                            | Fagraea fragrans.                                                             |
|                 | Capparis aphylla.                         | F. racemosa.                                                                  |
|                 | Carapa moluccensis.                       | Feronia Elephantum.                                                           |
|                 | Careya arborea.                           | Ficus bengalensis.                                                            |
|                 | Casearia glomerate.                       | F. retusa.                                                                    |
|                 | Cassia timoriensis.                       | Filicium deripiens,                                                           |
|                 | Castanopsis rufescens.                    | Garcinia speciosa.                                                            |
|                 | Cedrela Toona.                            | Garuga pinnate.                                                               |
|                 | Cedrus Libani, var. Deodara.              | Gluta elegans.                                                                |
|                 | Ceriops Candolleana.                      | Gmelina arborea.                                                              |
|                 | Chxtocarpus castanescarpus.               | Hardwickia binate.                                                            |
|                 | Chrysophyllum Roxburghii.                 | H. pinnata.                                                                   |
|                 | J Cinnamomum sp.                          | Heritiera littoralis.                                                         |
|                 | H. 439                                    |                                                                               |

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| • The Co                                                                    | oral Tree. <i>{J. Murray.</i> )                                                                                                | HOVENIA<br>dulcis, |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Heritiera Papilio.                                                          | Quercus dilatata.                                                                                                              | HOUSE-<br>BUILDING |
| Hopea odorata.                                                              | Q. fenestrata.                                                                                                                 | TIMBERS.           |
| H. parviflora.                                                              | Q. Griffithii.                                                                                                                 |                    |
| Ixora parviflora.                                                           | Q. incana.                                                                                                                     |                    |
| Juglans regia.                                                              | Q. lamellosa.                                                                                                                  |                    |
| Junipenis excelsa.                                                          | • Q. lanceaefolia.                                                                                                             |                    |
| Kj^dia calycina.                                                            | Q. semecarpifolia.                                                                                                             |                    |
| Lagerstramia Flos-Reginse.                                                  | Q serrata.                                                                                                                     |                    |
| L. hypoleuca.                                                               | Q. spicata.                                                                                                                    |                    |
| L. parviflora.                                                              | Rhododendron arboreum.                                                                                                         |                    |
| Litsoea zeylanica.                                                          | Salix daphnoides.<br>Salvadora oleoides.                                                                                       |                    |
| Lophopetalum Wightianum.                                                    |                                                                                                                                |                    |
| Machilus odoratissima.                                                      | Sapindus emarginatus.<br>Schima Wallichii.                                                                                     |                    |
| Maesa montana.                                                              | Schina Wanchi.<br>Shorea obtusa.                                                                                               |                    |
| Mangifera indica.                                                           | Shorea obtusa.<br>S. robusta.                                                                                                  |                    |
| Marlea begonisfolia.<br>Malanambaga ugitata                                 | S. siamensis.                                                                                                                  |                    |
| Melanarrhoea usitata.<br>Melia dubia.                                       |                                                                                                                                |                    |
| Melocanna bambusoides.                                                      | Shorea Talura.                                                                                                                 |                    |
| Meiocanna bannbusoides.<br>Mesua ferraea.                                   | S. Tumbuggaia.                                                                                                                 |                    |
| Michelia Champaca.                                                          | Sonneratia apetala.                                                                                                            | }                  |
| M. excelsa.                                                                 | Soymida febrifuga.<br>Stephegyne parviflora.                                                                                   | 1                  |
| Mimusops Elengi.                                                            | Stephegyne parvinora.                                                                                                          |                    |
| M. indica.                                                                  | S. sp.<br>Stereospermum chelonoides.                                                                                           |                    |
| M. littoralis.                                                              | S. suaveolens.                                                                                                                 |                    |
| Myristica malabarica.                                                       | Stiychnos potatorum.                                                                                                           | 1                  |
| Nyssa sessiliflora.                                                         | Symplocos lucida.                                                                                                              |                    |
| Ougeinia dalbergioides.                                                     | Tectona grandis.                                                                                                               |                    |
| Phoebe attenuata.                                                           | Terminalia Arjuna.                                                                                                             |                    |
| Phoenix sylvestris.                                                         | T. belerica. i                                                                                                                 |                    |
| Phyllanthus Emblica.                                                        | T. Chebula.                                                                                                                    | 1                  |
| Pinus excelsa.                                                              | T. citrina.                                                                                                                    |                    |
| P. Khasya.                                                                  | T. myriocarpa.                                                                                                                 | 1                  |
| P. longifolia.                                                              | T. tomentosa.                                                                                                                  |                    |
| Populus euphratica.                                                         | Ulmus integrifolia.                                                                                                            |                    |
| Premna longifolia.                                                          | Viburnum erubescens.                                                                                                           | 1                  |
| Prosopis spicigera.                                                         | Vitex alata.                                                                                                                   |                    |
| Pterocarpus Marsupium.                                                      | V. altissima.                                                                                                                  | Į                  |
| P. santalinus.                                                              | Wendlandia exserta.                                                                                                            | Ι.                 |
| Pterospermum suberifolium.                                                  | Wormia triquetra.                                                                                                              |                    |
| Quercus annulata.                                                           | ]                                                                                                                              | 1                  |
| HOVENIA, Thun                                                               | b. ; Gen. PI., I., <b>378.</b>                                                                                                 |                    |
| A genus of the RH'AMNE <sup>A</sup> : which China, Japan, and the Himalaya. | has only one species, distributed over                                                                                         |                    |
| <b>Iorenia dulcis,</b> <i>Thunb.; Fl. Br</i><br>THE CORAL TREE.             | ·. Ind., /., 640; Zamk., III., t. ↓ Jı ;<br>[ RHAMNEJE.                                                                        | 440                |
| Syn.—H. ACERBA, Lindl. ; H.<br>Vern.—Sicka, HIND.; Chamht                   | IKJEQUALIS, DC.                                                                                                                |                    |
| <b>References.</b> —/?^., Fl. Ind.,<br>Gamble, Man. Tintb., 88; Ro          | Ed. CB.C., 211; Brandis, For. FL, 94 -<br>byle, 111. Him. Bot., 123; Atkinson. Him<br>c. Prod, of NW. P., Pt. V., SS; Balfour, |                    |
| Cyclop., II., 116 ; Treasury of                                             | f <b>Bott</b> , <i>I</i> ., \$99.<br>. about 30 feet in height, with a straight                                                | ļ                  |

Habitat.—A small unarmed tree, about 30 feet in height, with a straight trunk, and broad rounded head, found in the subtropical Himálaya from

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| HUMULUS<br>Lupulus                         | The Wax-plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FOOD.<br>Pedicle,<br>441                   | Chamba and Hazara to Bhot£ri, at altitudes of front 3,000 to 6,500 feet.<br>It is also frequently cultivated. The tree flowefs in April-May, and pro-<br>duces a ripe fruit in July.<br>Food.—The fruit consists of a capsule with three seeds, resting on an<br>enlarged, arched pedicle, the size of a pea, which is soft, fleshy, and contains<br>a sweet juice. This PEDICLB is edible, having a pleasant flavour like that<br>of a Bergamot pear.                                         |
|                                            | <b>HOYA, Br.</b> ; Gen. PL, II, 776.<br>A genus of twining, pendulous, or rambling and rooting, rarely erect, shrubs, comprising about 60 species, natives of tropical Asia, the Malay Peninsula, and Australia. Of these about 40 are indigenous to India, but few are of economic                                                                                                                                                                                                            |
| 442                                        | <ul> <li>Australia. Of these about 40 are indigenous to india, but lew are of economic interest. Several of the species, however, are cultivated on account of the beauty of their flowers, under the popular name of WAX-PLANTS.</li> <li>Hoya pendula, <i>FL Br. Ind., IV., 61,- Wt., Ic, t.</i> 474; ASCLEPIADM.</li> </ul>                                                                                                                                                                 |
| FIBRE.                                     | <ul> <li>Syn.—ASCLEPIAS PENDULA, Roxb.</li> <li>Vern.—Dodi, hit an dori, BOMB.; Nasjera patsja, MALAY.</li> <li>References.—Roxb., FL Ind., Ed. C B.C., 253; Dalz. &amp; Gibs., Bomb. Fl.9</li> <li>152; Lisboa, U. PL Bomb., 233; Balfour, Cychp, II., 116.</li> <li>Fibre.—The plant is said by Lisboa to yield a useful fibre.</li> </ul>                                                                                                                                                   |
| 443                                        | H. viridiflora, R. Br., see Dregea volubilis, Benth. Vol. III., 193*                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                            | <b>HUGONIA</b> , <i>Linn.: Gen. PL</i> , /., 243, 987.<br>A genus of climbing shrubs of the Natural Order Linex, comprising about six species, natives of Tropical Asia, Africa, and Australia.                                                                                                                                                                                                                                                                                                |
| 444                                        | <ul> <li>Hugonia Mystax, Linn.; FL Br. Ind., L, 413; Wight, III., t. 32;</li> <li>Syn.—HUGONIA OBOVATA, Ham. ^ L LIINEJt.</li> <li>Vern.—Agure, TAM.; Gatrinta, tivoa potike, vendapa, kdki bira, TEL. 5<br/>Modera canni, MALAY.; Bugatteya, SING.</li> <li>References.—Dalz. &amp; Gibs., Bomb. FL, 17; Rheede, Hort. Mai., II* t.<br/>19; Elliot, FL Andhr., 58, 182, /9J; Drury, U. PL, 249; Balfour, Cy-</li> </ul>                                                                       |
| MEDICINE.<br>Roots.<br><b>445</b><br>Bark, | <i>clop., 11., 118.</i><br><b>Habitat.</b> —A rambling leafy shrub, with handsome, golden yellow<br>flowers, found in the Western Peninsula from the Konkan to Travancore,<br>and in Ceylon.<br>Medicine.—The bruised ROOTS are employed externally in reducing in-<br>flammatory swellings, and as an antidote to snake-bites. In the form of<br>a powder it is administered internally as an anthelmintic and febrifuge.<br>The BARK OF THE ROOT is also employed as an antidote to poisons. |
| 446                                        | HUMBOLDTIA, VahL; Gen. PL, /., 55rg.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                            | A genus of small unarmed erect trees, of the Natural Order LEGUMINO&ffi,<br>comprising four Indian species, natives of Southern India and Ceylon.                                                                                                                                                                                                                                                                                                                                              |
| TIMBER.                                    | Humboldtia unijuga, Bedd.; FL Br. Ind., II, 274; LEGUMINOSJB.<br>References.—Gamble, Man. Timb., 135; Beddome, Fl. Sylv.% t. 183.<br>Habitat.—A large tree of the Travancore Mountains, found at altitudes<br>from 3,000 to 4,500 feet.<br>Structure of the Wood.—Hard and durable {Beddome}*                                                                                                                                                                                                  |
| 447                                        | HUMULUS, Linn.; Gen. PL, III., 356.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| _                                          | A genus of perennial, twining, scabrid herbs, of the Natural Order URTI-<br>CACEJE, comprising two species, one Chinese and Japanese, the other the much<br>cultivated Hop plant. #                                                                                                                                                                                                                                                                                                            |
| 448                                        | Humulus Lupulus, Linn.; Fl. Br. Ind., V. <sub>f</sub> 487; Bent. & Trim.,<br>THE HOP. [Med. PL, 230; URTICACEJE.                                                                                                                                                                                                                                                                                                                                                                               |
|                                            | H. 44S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

#### The Hop.

HISTORY. 449

References.—Stewart, Pb. PL, 216; DC, Origin Cult. PL, 162; Aitchison, Botany of Afgh. Del. Comtn., 109 / Pharm. Ind., 214; Ainslie, Mat. Ind., I., xxlü; O'Shaughnessy, Beng. Dispens., 578; Flück. & Hanb., Phartnacog., 55 / #• S. Dispens., 15th Ed., 629, 744, 905; Year. Book Pharm., 1874\* 629; 1878, 223; t879> 4^6; Baden Powell, Pb. Pr., 247; Atkinson, Him. Dist., 707; Royle, Prod. Res., 427, 428; Liotard, Note on Hop Culture in India, i883; Balfour, Cyclop., II., 101; Smith, 'Diet\*, 2ts; Treasury of Bot., /., 601; Morton, Cyclop. Agri., II., 4\*: Kew Off. Guide to the Mus. of Kc. Bot., 120; Journ. Agri. Hort. Soc, /., 204; Transactions, V.,46; Quartly. Journ. of Agri., V. 0834-35), 519; XI. (1840), 41, 122; Madras Board of Rev. Procgs., June 1st, 1889, No. 266, 7; Nilgiri Rot. Gardens Rept., 1885-86; Chamba Administr. Rept., 1883-84; Special Reports:—Conservator of Forests, Panjdb, 1889; Dir. of Land. Rec. and Agri., N.-W. P. and Oudh; J. W. Lace, Esq., Quetta. H. Lace, Esq., Quetta.

Habitat.—A perennial, twining, scabrid herb, much cultivated in many parts of the world. A considerable amount of difference of opinion regarding the origin and present indigenous occurrence of the hop appears to exist amongst botanical writers. Thus in the *Flora of British India* it is described as native of North America, and perhaps of Northern Asia, while other authors agree in its being also indigenous to Europe, and certainly to Northern Asia.- DeCandolle writes: "The hop is wild in Europe from England to Sweden as far south as the mountains of the Mediterranean basin, and in Asia as far as Damascus, the south of the Caspian Sea, and of Eastern Siberia, but it is not found in India, the North of China, or the basin of the river Amur." He also mentions in a footnote, and apparently concurs in, the statement of Maximowicz that the plant is indigenous also in the east of the United States, and the Island of Yeso. The learned French writer, in support of his theory against the plant being an introduction into Europe from Asia, points out that its names in the different languages of Europe cannot possibly have been derived from one root, a circumstance which tends to confirm the idea that the hop existed in Europe before the arrival of the Aryan nations. The general consensus of opinion appears to be in favour of DeCandolle's view. With reference to the statement of the *Flora of British India* that it is perhaps indi-genous to Northern Asia, it may be remarked, that the plant was found by Aitchison while with the Afghan Delimitation Commission, forming, with other shrubs, impenetrable hedges over the whole country between the foot of the mountains at Asterabad and the Caspian Sea.

History.—It would seem, from the evidences afforded by philology, that the Hop plant was known and employed for some purpose long before it was used in brewing, but on this subject ancient authors throw very little light. CeCandolle remarks that, judging from the Italian name lupulo, however, it would appear probable that the plant was one of the vegetables mentioned by Pliny under the name lapus salictarius. Hop gardens are first mentioned in an act of donation made by Pepin, father of Charlemagne in 768. In the eleventh century Bohemian and Bavarian hops became famous, and in 1069 William the Conqueror is said to have made a prant of hops and hop lands in the county of Salop. Fluckiger and Hanbury, in their interesting account of the history of the plant, write: "As to the use made of hops in these early times it would appear that they were regarded in somewhat of a medicinal aspect. In the *Herbarium* of *Apuleius*, an English manuscript written about A.D. 1050, it is said of the hop (*hymele*) that its good qualities are such that men put it in their usual drinks; and St. Hildegard, a century later, states that the hop (*hoppho*) is added to beverages, partly for its wholesomeness and bitterness, and partly because it makes them keep." As in the case of several other important plants, the use of the hop appears to have come under local restriction. portant plants, the use of the hop appears to have come under legal restric

HUMULUS

Lupulus.

(J. Murray-)

| HUMULUS                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lupulus.               | The Cultivation of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| HISTORY.               | tions as it began to be largely employed. Thus in the reign of Henry VI. (1425-26) an information was laid against a person for putting into beer "an unwholesome weed called an hoop," and in the same year Parliament was petitioned against "that wicked weed called hops" ( <i>Flückiger and Hanbury</i> ). Notwithstanding these restrictions and regulations, the degree of utilisation of the plant increased, till in the reign of Edward VI., its cultivation was directly sanctioned by an Act of Parliament. Since that time it has become more and more regarded as an essential constituent of beer, and the cultivation of the plant has steadily increased in extent and importance, till in 1873 the area under the crop in Kent alone was 39,040 acres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CULTIVA-<br>ION<br>450 | Cultivation.—As already mentioned, the hop is not indigenous in India,<br>and its cultivation is still only experimental. The first trial appears to<br>have been made at Dehra Dfin, with plants obtained by Lord Auckland,<br>presumably about the year 1840. Since then it has been attempted in the<br>Upper Chenab region of the Panjáb, Kashmir, and many other places with<br>more or less success. Owing very probably to ignorance in selecting the<br>best localities for the growth of the plant, and partly also to want of know-<br>ledge of the best methods of cultivation, the attempts made in many parts<br>have not been pecuniarily successful. Thus Dr. Stewart writes: "In 1851<br>Lowther proposed its introduction into Kashmir. It has been successfully<br>cultivated in Dehra Dún for many years, so far as mere growth is con-<br>cerned, but heavy rain at the flowering period prevents the flower from<br>reaching perfection. As to the quantity and quality of the powder on which<br>its value depends, the results have on the whole been unsatisfactory.<br>Within the last few years the plant has been tried at Kyelang and Kilar<br>in the arid tracts of the Upper Chenab, and it has flourished. But, un-<br>fortimately, it has been found out, after several years' care, that the sets,<br>introduced at the latter place, were those of male plants, so that the experi-<br>ment ha'still to get a fair trial there!" Up to the present time the efforts<br>to cultivate hops appear to have been accompanied by the greatest degree<br>of success in Kashmir (which in 1883 exported 15,000%, to one of the<br>Himalayan breweries), and in Chamba, the Administration Report of which<br>for 1883-84 contains the information that the cultivation of hops, recently<br>tried as an experiment, had proved successful, the crop raised having<br>been of such excellent quality as to obtain a medal at the Amsterdam Exhi-<br>bition ; and in 1884-85 it is further reported that efforts continued to be<br>rewarded by success, 63 maunds having been sold to the Murree Brewery<br>Company for ((2,770. Mr. Liotard in 1883 wrote a note on the subject,<br>poi |
|                        | Н. 450                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Hop-plant. | (J. Murray). | HUMULUS<br>Lupulus. |
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|            |              |                     |

at £15 per cwt., in order to make a separate brew with them; and others ask for quantities larger than those sent. The suggestion is that samples should be procured from the vines directly the burr turns a fair straw colour (if left until brown they are spoilt); and they should be lightly packed in cases or bags, the drying to be done within six hours of picking.

" As to future action it is said that if hops, of such quality as the samples must have been before they were spoilt, can be produced in any quan-tity in the Panj&b or in districts in the neighbourhood of breweries, there is no doubt that they would handsomely pay to cultivate.

" Experience has, however, proved the inutility of attempting to grow hops in any part of the Himalayas visited by heavy rainfall at a time of the year when the pollen is exposed to be washed off. But in Himalayan"tracts which escape the violence of the summer monsoon there appears to be a very good chance of success. The question whether any tracts in the Nilghiris are suited to hop-growing is one which is under enquiry.

' There does not appear to be any reason why India should not produce hops for its own breweries in those Provinces in which suitable localities can be found, and European settlers in the hills might be induced to take up the subject. That growers would find a ready market for their hops is sufficiently shown by the large and increasing demand.'

Since the date of Mr. Liotard's paper, enquiries have been made regarding the success or otherwise of hop cultivation in the various regions in which it has been attempted -, in answer to which the following replies have been received.

1. From the Conservator 0/ Forests, Panja'b.—" The cultivation of Hops was tried by Colonel Rennick in Bajaura, but was abandoned on account of the cost of hop poles. The Murree Brewery also made an attempt near Abbottabad, which was apparently successful; but was not continued. Hops were also introduced into Kilar in Chamba by Mr. Elles, where there are now some five acres under white line cultivation; the gardens chiefly belong to the Raja, though some zamindars at Re and Pontu have grown them remuneratively: the chief market is at Dalhousie."

2. From the Director of Land Records and Agriculture, North-West Provinces and Oudh.—<sup>U</sup> Hops have not been grown with any commercial success in any part of these provinces. There are certain tracts in the Raja of Tehri's territory and in the villages of Badrinath and Kedarnath in British Garhwal, where it is believed that hops might be cultivated with success, but until the roads are improved and rendered fit for mule carriage the cost of transport must absorb all profit."

With reference to Mr. Liotard's suggestion that the crop might possibly be profitably cultivated on the Nilghiris, it is disappointing to find in the report of Proceedings of the Madras Board of Revenue, dated 1st June 1889, that several attempts have been made to introduce the cultivation but without success.

It would thus appear that the only districts which have up to this time shqwn any promise of attaining success with hops are Chamba and Kashmir. The present rapid increase in the demand for hops for brewing purposes is likely, however, to induce further endeavours on the part of planters, European and Native, and it is to be hoped that with greater care in the selection of suitable localities, and in methods of cultivation, the crop may yet become a more generally remunerative one.

Medicine.—The officinal parts of the hop are, the dried STROBILES of the female plant called Lupulus or hop, in the British and Indian Pharmacopoeia, and Humulus in the United States Dispensatory; and also in the latter, Lupulina, or the yellow powder separated from the strobiles.

MEDICINE. Strobiles. 451

CULTIVA-

TION.

| HUMULUS            | Medicine and Chemical composition of Hops.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| MEDICINE.          | The strobiles, as found in commerce, are more or less broken up and<br>compressed When fresh they have a pale yellowish green colour, an<br>agreeable, peculiar, somewhat aromatic and narcotic odour, and a bitter,<br>aromatic, pungent, and feebly astringent taste. When handled, or more                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Chemistry.         | especially when rubbed between the fingers, they have a sticky feel, and<br>their odour becomes more evident. But by keeping, their odour becomes<br>less agreeable, or even unpleasant, owing to the formation of a -little vale-<br>rianic acid. At the same time they lose their greenish yellow colour and<br>fresh appearance, acquire a brown tint, and frequently a spotted appearance,<br>and finally become weaker and of inferior value { <i>Bentley and irimen</i> ) <sub>%</sub><br>CHEMICAL COMPOSITION.—Over and above the constituents of the                                                                                                                                                                                                                                                                                                                                                                                                |
| 452                | glands, or lupulina, which will be described below, the scales of the stro-<br>biles contain <i>lupulo-tannic acid</i> in the proportion of from 3 to 5 jrcr cent.,<br>a minute quantity of <i>trimethylamine</i> , and a liquid volatile alkaloid, named<br>by Griessmayer <i>lupuline</i> , and said to have the odour of the opium deri-<br>vative <i>conia</i> . Etti further demonstrated the existence in hops of arabic acid,<br>phosphates, nitrates, malates, citrates, and also sulphates, chiefly of potas-<br>sium.                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | The yellow powder separated from the strobiles,—Lupulina-consists<br>of minute, shining, translucent glands, in which the medicinal properties<br>of the plant essentially reside. The powder is obtained by stripping off<br>the bracts, shaking and rubbing <sup>1</sup> them, and then separating it by means of<br>a seive. The product thus obtained is yellowish brown and granular, with<br>the agreeable odour and bitter taste of hops, easily wetted by alcohol or<br>ether, but only gradually by water. Chemically, Lupulina consists prin-                                                                                                                                                                                                                                                                                                                                                                                                     |
|                    | cipally of <i>wax</i> and two <i>resins</i> , one of which is crystalline and unites with<br>bases, while another is amorphous and brown, and is closely associated<br>with the bitter principle. The medicinal virtues, however, appear to reside<br>chiefly in a <i>volatile oil</i> and a <i>bitter principle</i> , both of which may be<br>extracted by alcohol. The latter has been variously named <i>lupulin</i> ,<br><i>lupulite</i> , and <i>humuline</i> , but was first separated in a pure condition by<br>Lermer, who called it the <i>bitter acid of hops</i> . It crystallizes in large brittle                                                                                                                                                                                                                                                                                                                                              |
|                    | and rhombic prisms, possesses in a marked degree the peculiar bitter taste<br>of beer, and is probably the tonic principle of the plant. The volatile oil<br>may be readily obtained by distilling hops with water, the yield varying<br>from 1 to 2 per cent. It contains a substance called <i>valerol</i> , which readily<br>passes into <i>valerianic add</i> (the cause of the disagreeable odour of old<br>nops), and the entire oil rapidly resinifies on exposure to the air. For<br>this reason Lupulina, which owes much of its medicinal properties and aroma<br>to this oil, ought to be used fresh, and when kept for some time ought to<br>be preserved in closely-stoppered bottles.                                                                                                                                                                                                                                                         |
| Properties.<br>453 | MEDICINAL PROPERTIES.—Therapeutically hops possess tonic, seda-<br>tive, and also to a small extent astringent, properties. They are admi-<br>nistered chiefly in the form of tincture, infusion or extract in cases of<br>atonic dyspepsia, nervous affections attended with sleeplessness, hysteria,<br>intermittent fevers, and rheumatism ; while lupulina exercises a marked-<br>ly beneficial influence in cases of spermatorrhoea, chordee, and enuresis.<br>since the narcotic property appears to reside chiefly in the volatile oil, a pil-<br>low stuffed with the strobiles, but wetted with alcohol to prevent rustling, is<br>sometimes employed to prevent restlessness and induce sleep. Advantage<br>has also been taken of the anodyne property of the oil in the preparation of<br>external applications, poultices, or fomentations for painful swellings and<br>inflammation, and an ointment for cancerous tumours. Neither the stro- |
| food.<br>454       | biles, nor the granular powder, are, however, employed extensively alone<br>in European medicine, though they are valued as adjuncts to other drugs.<br>Food.—The chief consumption of hops is in the manufacture of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    | H. 454                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Sandbox Tree.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (J. Murray,)                                                                                                                                                                                                                                      | HURA           |
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| · <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                   | crepitans.     |
| beer and ale, for an account of their employment in whi<br>referred to the article on "MALT LiauoRS,"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ch the reader is                                                                                                                                                                                                                                  | FOOD.          |
| Trade.—The steady Increase of brewing' «n India l<br>continuous and rapid development of the amount and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | nas occasioned a '<br>value of the im-                                                                                                                                                                                                            | TRADE.         |
| ports of hops into the country. Thus the average import for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | or the five" years                                                                                                                                                                                                                                | 455            |
| ending 1882-83 was 2,525 cwt., valued at R2,95,108, while<br>years following was nearly double, <i>vie.</i> , 4.401 cwt., value<br>highest import up to the year 1887-88 was in that year, a<br>5,838 cwt., value 84,74,345. The countries growing and<br>appear t6 be increasing in number, thus in 1882-83 o<br>obtained only from the United Kingdom, Italy, and Chin<br>88. <i>ft</i> ustria, Australia, and Ceylon each formed an add<br>supply, and the article obtained from Australia appear<br>much the most valuable ; at all events it fetched much th<br>tionate price. Out of the 5,838 cwt, imported in that<br>Kingdom furnished 3,968 cwt., value R3,10,349; Italy<br>R79,642 ; China 357 cwt., value 850,264; AusIria 203 cwt<br>Australia 125 cwt, value {(20,720; and Ceylon 22 cwt., value | that for the five<br>1*3,59,022. The<br>and amounted to<br>d exporting hops<br>ur imports were<br>a, while in 1887-<br>ditional source of<br>rs to have been<br>e highest propor-<br>year, the United<br>1,163 cwt., value<br>t., value Ri 1,750; |                |
| HUNTERIA, Roxb.; Gen. PL, II, 69                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 8.                                                                                                                                                                                                                                                |                |
| A genus of glabrous trees belonging to the Natural Order<br>and comprising three Indian species, of which only one is import                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | APOCYNACEE.                                                                                                                                                                                                                                       |                |
| Hunteria corymbosa, <i>Roxb.; Fl. Br. Ind., III., 63</i> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                   | 456            |
| [ /. 42.<br>Syn.—HUNTERIA ZEYLANICA, Gardn.; H. LANCEOLATA,<br>ALYXIA ROXBURGHIANA, Wight, Ic.,t. 1294; GYNOPO<br>KltrB, For. Fl., II., 177 f TABERNIEMONTANA SALIC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8 ; APOCYNACE-ZE.<br>Wall., Cat., 1611 ;<br>GONLANCEOLATVM,                                                                                                                                                                                       |                |
| PARVI FLORA, Herb, Heyne.<br>References.— Roxb., Fl. Ind., Ed. C. B. C, 233; Kur<br>II., 177; Beddome, For. Fl., II., t. 26\$; Thwaites, En.<br>Bal/our, Cyclop., II., 121.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Ceylon PI., 191;                                                                                                                                                                                                                                  |                |
| Habitat.—A tree with slender smooth branches, inhab<br>Peninsula, Tavoy, Penang, Ceylon, and Tenasserim.<br><b>Structure of the Wood.</b> —Fine, close-grained, and l<br>boxwood ( <i>Thwaites</i> ). It answers well for engraving ( <i>Beda</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | hard, resembling                                                                                                                                                                                                                                  | TIMBER.<br>457 |
| HURA, Linn.; Gen. PL, III., 339.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                   |                |
| # A genus of the EUPHORBIACEJE, having no Indian repression which one species has been introduced from the West Indies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | sentative, but of                                                                                                                                                                                                                                 | 4              |
| Hura crepitans, <i>Linn.,- DC, Prodr., 1229;</i> EUPHORI<br>SANDBOX TREE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | BIACE^.                                                                                                                                                                                                                                           | 458            |
| References.— Voigt, Hort. Sub. CaL, 161; Dale. &<br>Suppl., 76; Smith, Die, 36\$; Treasury o/Bot., /., 60.<br>Habitat.—A small armed tree, from 30 to 40 feet hi<br>prickles on the stem, indigenous in Tropical America, an<br>Irdia from Jamaica.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2.<br>igh, having a few                                                                                                                                                                                                                           |                |
| OilA clear, pale-coloured fluid oil is obtained from t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                   | OIL.           |
| properties are as yet not well known. Since the whole tree<br>extremely poisonous milky juice, which when applied t<br>almost immediate blindness, it appears probable that the<br>of the same deleterious properties                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | to the eye causes                                                                                                                                                                                                                                 | Seeds.<br>459  |
| of the same deleterious properties.<br>Medicine.—The SEEDS are emetic, and in a fresh sta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | te violently nur-                                                                                                                                                                                                                                 | MEDIÇINE.      |
| gative, a property which, however, they seem to lose when                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | dried. The OIL                                                                                                                                                                                                                                    | Seeds.<br>460  |
| is said to be a useful though very drastic purgative, 20 d action half an ounce of castor oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | rops equalling in                                                                                                                                                                                                                                 | Oil.           |
| 20 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | H, 461                                                                                                                                                                                                                                            | 461            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11, 701                                                                                                                                                                                                                                           |                |

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| HYDNOCAR             | PUS Thortay Oil.                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | •                                                                                                                                                                                                                                                                                                                                                                                                      |
| TIMBER.<br>462       | <b>Structure of the Wood.</b> —Soft and friable; the hollowed trunks are said to be employed in the West Indies as vats for cane juice.                                                                                                                                                                                                                                                                |
| 1                    | Husks Of the Scripture, see Ceratonia Siliqua, Vol. II., 254.                                                                                                                                                                                                                                                                                                                                          |
|                      | HYDNOCARPUS, <i>Gartn.; Gen. PL, I., 129.</i><br>A genus of trees belonging to the BIXINE&, and comprising about six                                                                                                                                                                                                                                                                                   |
|                      | species, inhabitants of Tiopical Asia. [/. 942; BIXItfSiĒ.                                                                                                                                                                                                                                                                                                                                             |
| 463                  | Hydnocarpus alpina, Wight; FL Br. Ind., I., 197; Wight, Ic,<br>Vern.—Kastel, MAR.; Maratatti, NILGHIRIS; Torathi, sannafolti, KAN.<br>References.—Bedd., Ft. Sylv.,t. 77; Gamble, Man. Timb, 16; Thwaites,<br>En. Ceylon PL, /p; Trimen, Cat. Ceylon PL, 6; Indian Forester,<br>11., 22, 23; Balfour, Cyclop., 11., 136; Bombay Gazetteer, XV'. (FSanara                                               |
| 1                    | <i>Pt.I.,7'.</i>                                                                                                                                                                                                                                                                                                                                                                                       |
|                      | Habitat.—A large tree, 70 to 100 feet in height, common on the Nilghins<br>up to 6,000 feet, found also on the Calcad hills, Tinnevelly, at an elevation<br>of 1,500 feet, and probably throughout the western ghats of Madras; also<br>in Ceylon at an elevation of 1,500 feet ( <i>Beddome</i> ). It is also mentioned in<br>the <i>Kdnara Gazetteer</i> as growing in the forests of that district. |
| OIL.                 | Oil.—The SEEDS yield an oil, which is employed for burning in Karwar                                                                                                                                                                                                                                                                                                                                   |
| Seeds.<br><b>464</b> | (Kdnara Gazetteer).                                                                                                                                                                                                                                                                                                                                                                                    |
| TIMBER.              | <b>Structure of the Wood.</b> —Splits readily, much used on the Nilghiris and                                                                                                                                                                                                                                                                                                                          |
| <b>4</b> «           | in Kdnara, for beams and rafters in house-building, also employed in making packing cases and for firewood.                                                                                                                                                                                                                                                                                            |
| 466                  | <b>H. heterophylla</b> , ^/./ <i>Kurz</i> , <i>Fr. FL Burm</i> ., /., 77.                                                                                                                                                                                                                                                                                                                              |
| 400                  | Vem: Kal-law-hso, Bu RM.                                                                                                                                                                                                                                                                                                                                                                               |
| TIMBER.              | Habitat.—An evergreen tree from 40 to 50 feet in height, very frequent<br>in the tropical forests of Martaban, less so along the eastern and southern<br>slopes of the Pegu Yomah; found also in Tenasserim. It flowers in April<br>and fruits in February and March ( <i>Kurz</i> ).<br>Structure of the Wood.—Heavy, strong, close-grained, of short fibre*                                          |
| 467                  | yellowish white, turning light brown ( <i>Kurz</i> )*                                                                                                                                                                                                                                                                                                                                                  |
|                      | H. Odorata, Lind., see Gynocardia odorata, Roxb. p. 192,                                                                                                                                                                                                                                                                                                                                               |
| 468                  | H. venenata, Gcertn.; FL Br. Ind., I., 196.                                                                                                                                                                                                                                                                                                                                                            |
|                      | Syn. —HYDNOCARPUS INEBKIANS, Vahl.; non Wall.<br>Vem.—Jangli-badam ? (Bidie), HIND.; Jangli-badam? (Bidie), DEC. ;<br>Kauti, MAR. J Niradi-mattu, marra vittai, TAM.J Niradi, TEL.J MO-<br>ratti, MALAY.; Makúlú, SING.                                                                                                                                                                                |
|                      | References.—Thwaites, En. Ceylon PL, 18; Rheede, Hort. Mal.,l.,t.<br>36; Trimen, Cat. Cey. PI., 6; Bidie, Cat. Paris Exhib., No. 639;<br>Flück. & Hanb., Pharmacog., 76; Drury, U. PL, 249 (partly refers<br>to H. inebrians, Wall.); Cooke, Oils and Oilseeds, 17; Balfour,<br>Cyclop., 11; 136; Treasury of Bot., I., 604.                                                                           |
|                      | Habitat.—A large tree, found in Ceylon by the bank of rivers up to 2,000 feet, also in Malabar, Tinnevelly, and Travancore.                                                                                                                                                                                                                                                                            |
| OIL.                 | Oil.—The SEEDS yield an oil of the consistence of ordinary hard salt                                                                                                                                                                                                                                                                                                                                   |
| Seeds.<br><b>460</b> | butter, called the <i>Thortay</i> oil in Kánara.                                                                                                                                                                                                                                                                                                                                                       |
| MEDICINE.            | Medicine.—The OIL above mentioned is used as an external application<br>in certain cutaneous diseases, and has a special reputation in leprosy.                                                                                                                                                                                                                                                        |
| Oil.<br><b>470</b>   | It has been recommended as a substitute for <i>chaulmugra</i> oil obtained<br>from Gynocardia odorata. Dr. Bidie, however, thinks that its good                                                                                                                                                                                                                                                        |
| Seeds.               | effects are doubtful. The SEEDS, if eaten, produce giddiness, and are em-                                                                                                                                                                                                                                                                                                                              |
| 471                  | ployed by the natives to poison fish. Their poisonous properties, how-                                                                                                                                                                                                                                                                                                                                 |
| 472                  | ever, are so strong that fish, thus killed, are unfit for food.<br>H. Wightiana, BL; FL Br. Ind., I., 196; Wight, III., I., t. 16.<br>Syn.—H. INEBRIANS, Wall, non VahL; MUNICKSIA, Dennstd,                                                                                                                                                                                                           |
|                      | H. 472                                                                                                                                                                                                                                                                                                                                                                                                 |

# Substitute for Chaulmugra Oil. (J. Murray.) HYDNOCARPUS

## <u>Wightiana</u>

- Vern.—Jangli-bdddm (-"seeds), jangli-baddm kd tel (=oil), DEC. ; Kowti, kadu-kavatha, knva, kanti (koslo at GOA), BOMB. ; Kowti, kadukavata (kavatela—oil), MAR. ; Yetti, maravetti (niradimuttu=seeds), (niradtmuttv-enney=o||), TAM.; Niradi-vittulu (—seeds), niradi-vitttilunttne (=oil), TEL. ; Tamana, maravetti, MALAY. ; MakuH {ratakekuna =seeds), SING.
- Steeds), Stick.
  References.—Dalz. & Gibs., Bomb. Fl., //; Rheede, Hort. Mai,, /., 65, t 36; Pharm. Ind., 27; Ainslie, Mat. Ind., II., 23\$; Moodeen Sheriff, Mat. Med. Madras, 34; Dymock, Mat. Med. W. Ind., 2nd Ed.,yt; Phnrmacog. Indica, Pt. I., 148; Fliick. & Hanb, Pharmacog., 76; S. ^rjun, Bomb. Drugs, 14; Bidie, Cat, Paris Exhib., No. 633; Lisboa, ^U. PL Bomb., 260, 272; Gazetteer, Bombay, XVII. {Ahmednagar), 25.

Habitat.— A common tree of the Western Peninsula from the Konkan along the coast ranges.

Oil.—The SEEDS yield by expression, or on boiling them in water, about 44 per cent of oil, which has a sherry-yellow colour, is devoid of characteristic taste or odour, and has a sp.  $gr_{t}$  at  $85^{\circ}$  Fh., of '9482. Unlike the *chaulmugra* oil (obtained from the seeds of the allied Gynocardia odorata), which it otherwise closely resembles, it does not, at least at ordinary temperatures, deposit a crystalline fatty acid. Treated with sulphuric acid the oil affords the gynocardic acid reaction (see Gynocardia odorata, *p. 192)1* but in a less degree than *chaulmugra {Pharmacographia Indica)\** According to Lisboa it is chiefly employed as a lamp oil in Goa.

Medicine.—The SEED has long been employed as a domestic remedy, by the natives of the Western coast ranges, in cases of skin disease and ophthalmia, and as a dressing for wounds and ulcers. At the present day the OIL is employed as an external application to scabby eruptions, after being mixed with an equal portion of Jatophra Curcas oil, sulphur, camphor. and lime-juice. For scald-head equal parts of the oil and limewater are used as a liniment. In the Konkan also the oil has a reputation as a remedy for *Barsati* in horses. In Travancore half teaspoonful doses are given internally in leprous affections, and the oil, beaten up with the kernels and shells of castor-oil seeds, is used as a remedy for itch (Pharmacographia Indica). The medicinal properties of the seeds depend wholly on the oil they contain, which is much more useful and convenient as a drug than the seeds themselves. Though the seeds of this plant are evidently those described by Ainslie under the name of Neeradimootoo, the medicinal properties of the oil they yield were neglected, till recently, when the oil was again brought to the notice of Europeans as a substitute for the more expensive *chaulmugra* oil. Since then it has been tried and appears to have given satisfactory results. In physiological action it is alterative, tcnic, and a local stimulant, and appears also to have a specific effect on certain skin diseases. It has been recommended for trial as a local application in rheumatism, leprosy, sprains and bruises, sciatica, chest affections and phthisis, ophthalmia, and in various forms of skin disease. Internally it may be prescribed in doses of from 15 minims to 2 drachms in cases of leprosy, various forms of cutaneous disease, secondary syphilis, and chronic rheumatism. It must, however, be employed with caution, as in certain cases it is said to act as a gastrointestinal irritant, producing vomiting and purging.

Trade.—The price of the SEEDS, according to Dr. Moodeen Sheriff, is R2-8 per maund wholesale, and annas 2 per pound retail in the bazaV. The authors of the *Phtir?nacogrnphia* write : "The seeds are not an article

• of trade, but if ordered may be obtained at about half the price of those of *chaulmugra* (R12 per Bengal maund of 80lb). The OIL has been sold in t Madras at 2J annas per seer."

OIL. Seeds. 473

MEDICINE. Seed. 474 011. 475

> TRADE. Seeds. **4/6** 011. **477**

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| HYDRILL                      | A Hydrangea; the Hydrilla Water-plant.                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| verticillat                  |                                                                                                                                                                                                                                                                                                                                                                                                             |
|                              | HydnutXl COralloideS, see Mushroom, also Agaricus campestris, Vol.<br>[I , I3 <sup>1</sup> -                                                                                                                                                                                                                                                                                                                |
|                              | HYDRANGEA, Linn.; Gen. PL, I., 640.                                                                                                                                                                                                                                                                                                                                                                         |
|                              | A genus of large shrubs or trees, often subscandent when young, belorging<br>to the Natural Order SAXIFRAGACE^E, and comprising 33 species, distributed<br>from Java to the Himálaya and Japan (th'e centre of the genus), Eastern<br>North America, and Western South America. Of these species five or six are<br>Indigenous to India.                                                                    |
| 478                          | Hydrangea altissima, <i>Wall.; Fl. Br. Ind., II, 404;</i> SAXIFRAGACEIB.                                                                                                                                                                                                                                                                                                                                    |
|                              | References.— <i>Gamble, Man. Timb., 172; Brandts, For. Fl.,Wk</i><br>Habitat.—A tall spreading shrub, of the Himálaya, from the Sutlej to                                                                                                                                                                                                                                                                   |
| DOMESTIC                     | Bhotán, above 5,000 feet.                                                                                                                                                                                                                                                                                                                                                                                   |
| USES.<br>Bark.<br><b>479</b> | Domestic Uses.—Its BARK is employed as a substitute for paper. Tm <sup>s</sup> economic use of the bark was first pointed out by Thomson, and is quoted by Stewart under the heading of Hydrangea sp.                                                                                                                                                                                                       |
| 480                          | H. robusta, H. f. & T.; Fl. Br. Ind., II., 404.                                                                                                                                                                                                                                                                                                                                                             |
|                              | Syn.—HYDRANGEA CYANEMA, Rutt.                                                                                                                                                                                                                                                                                                                                                                               |
|                              | Vern.—Bogoti, NEPAL.                                                                                                                                                                                                                                                                                                                                                                                        |
|                              | <b>References.</b> —Gamble, Man. Timb., 172; Tkwaites, En. Ceylon PL, *<>*'<br>Gamble, List of Trees, Shrubs, &c, in Darjilin‰ 38.                                                                                                                                                                                                                                                                          |
|                              | Habitat.—A small deciduous tree, found in the Eastern Himálaya and                                                                                                                                                                                                                                                                                                                                          |
|                              | Sikkim, from 5,000 to 7,000 feet, generally as undergrowth in the oak                                                                                                                                                                                                                                                                                                                                       |
|                              | forests ,                                                                                                                                                                                                                                                                                                                                                                                                   |
| TIMBER<br><b>481</b>         | Structure of the Wood.—White, moderately hard, close-grained-                                                                                                                                                                                                                                                                                                                                               |
| 401                          | Weight 42ft per cubic foot, easily worked.                                                                                                                                                                                                                                                                                                                                                                  |
| 100                          | H. sp.; Stewart, PanJAb Plants, IOJ, see H. altissima.                                                                                                                                                                                                                                                                                                                                                      |
| 482                          | H. vestita, Wall.; Fl. Br. Ind., II., 40\$.                                                                                                                                                                                                                                                                                                                                                                 |
| •                            | Sy*—HYDRANGEA HETEROMALLA, Don; H. KHASIANA, H.f. & T.<br>Vern.—Pokuttia, NEPAL; Kulain, BHUTIA.<br>References.—Brandts, For. FL, 211; Gamble, Man. Timb. <sub>%</sub> 172; List of<br>Trees. Shrubs, &c, of Darjiling, 38; Wall, Cat., 440 a; Indian Forest-                                                                                                                                               |
|                              | <i>er, XI., 3.</i>                                                                                                                                                                                                                                                                                                                                                                                          |
|                              | Habitat.—A small deciduous tree, met with in the Himálaya from<br>Kum4on to Bhotán between 8,000 and 11,000 feet; also in the Khásia<br>Hills from 4,500 to 5,500 feet.                                                                                                                                                                                                                                     |
| TIMBER.                      | Structure of the Wood.—Pinkish white, moderately hard, annual                                                                                                                                                                                                                                                                                                                                               |
| 483                          | rings indistinct, weight 45ft per cubic foot.                                                                                                                                                                                                                                                                                                                                                               |
|                              | Hydrargyrum, see Mercury; Vol. V.                                                                                                                                                                                                                                                                                                                                                                           |
|                              | <b>HYDRILLA,</b> <i>L. C. Rich.; Gen. PL, III., 450.</i>                                                                                                                                                                                                                                                                                                                                                    |
|                              | A genus of submerged leaf y dioecious water herbs, belonging to the Natural<br>Order HYDROCHARIDE-E, and having only one species, which is distributed in<br>the still and slowly running waters of Tropical Asia and Australia.                                                                                                                                                                            |
| 484                          | Hydrilla verticillata, Casp.; Fl. Br.Ind., V., 6\$\$; HYDROCHARIDE^.                                                                                                                                                                                                                                                                                                                                        |
|                              | Syn.—HYDRILLA OVALIFOLIA, Rich. / H. DENTATA, Casp.; H. WIGHTII,                                                                                                                                                                                                                                                                                                                                            |
|                              | Planch.; H. ANGUSTIFOLIA, Blume; LEPTANTHES VERTICILLATA, Kerb-                                                                                                                                                                                                                                                                                                                                             |
|                              | Wight; SERVICVL/L VERTICILLATA, Linn.f.; VALLISNERIA VERTICIL-<br>LATA, Roxb. ; HOTTONIA SERRATA, Willd.                                                                                                                                                                                                                                                                                                    |
|                              | Vera.—Jhangi, kureli, HIND.; Jhanjh, fdla, PB.; Punacku, pdchi,                                                                                                                                                                                                                                                                                                                                             |
|                              | <i>ndchu</i> (these names are according to Elliot applied indifferently to all corts of hostococcus occustic plants) TEL                                                                                                                                                                                                                                                                                    |
|                              | sorts of herbaceous, aquatic plants), TEL.<br>References.—Roxb., Fl. Ind., Ed. C.B.C., 6\$3, 7TT / Cor. PL, II., t. 164:                                                                                                                                                                                                                                                                                    |
|                              | <b>References.</b> Roxb., Fl. Ind., Ed. C.B.C., 6\$3, 7TT / Cor. PI., II., t. 164;<br>$X^{W} \pounds ?^{M} \gg \frac{E_{n}}{2^{4}} e^{V} \circ n$ PI-, 33i; Dale. & Gibs., Bomb. FL, 277; Stewart,<br>$\langle \cdot, \bullet \cdot \bullet \rangle \xrightarrow{2^{4}} e^{V} e^{V} \circ n$ Cat. Pb. and Sind PL, 146; Boiss., FL Orient.,<br>$V \oplus V H = 0$ Cat. Flict EL Andhr. 160; Category Museus |
|                              | V.,8;Wall., Cat., 5048; Elliot, FL Andhr., 160; GazetteersMysore<br>and Coorg, I. <sub>ss</sub> 6; NW. P., /. (Bandelkhand), 84; IV. (Agra), and the second second second second second second                                                                                                                                                                                                              |
|                              | H. 484                                                                                                                                                                                                                                                                                                                                                                                                      |

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| The Aslauc Tenny-wort. (J. Murruy.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ROCOTYLE                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Habitat.—A submerged leafy herb, forming large masses in the still and<br>slowly running waters throughout India and Ceylon.<br>Industrial Uses.—Along with other water plants this herb is employed<br>•in many parts of India in the process of sugar refining. The surface of the<br>sugar is covered with it, as it is with clay in the West Indies, to ensure<br>slow percolation of the water afterwards applied (see Saccharum officinarum).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | INDUSTRIAL<br>USES.<br>Sugar<br>refining.<br>485 |
| Hydrochlorate of Cocaine, see Erythroxylon Coca; Vol. III., p. 270.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                  |
| <b>HYDROCOTYLE,</b> <i>Linn.; Gen. PL</i> , <i>/.</i> , <i>872.</i><br>Agfeusof prostrate herbs belonging to the UMBELLIFKR^, and comprising<br>about 70 species which are found in wet places in temperate and tropical regions,<br>tmjre, especially of the Southern hemisphere. The generic name is derived<br>from viwp = water and $KOTvXq$ = a cavity or vase, in reference to the pecu-<br>liar rounded concave leaves of the plants. $\pounds$ jtfg, UMBELLIFEEUE.<br><b>Hydrocotyle asiatica,</b> <i>Linn.; Fl. Br. Ind., II., 66g; Wight, Ic, t.</i><br>ASIATIC PENNY-WORT, <i>Eng.;</i> BEVILACQUA, <i>Fr.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 486                                              |
| Syn.—HYDROCOTYLE WIGHTIANA, Wall.; H. LURIDA, Hance. Vern.—Br&hmamanduki, khulakhudi, HIND.; Thol-kuri, brdhmamanr<br>duki, BENG.; Bhika-pumi, DACCA; Mani-muni, ASSAM 5 Valldri, DEC.;<br>Karivana, karinga, BOMB.; Brahmi, MAR.; Barmi, Guz.; Valldrait<br>babassa, TAM.; Manduka-bramha-kurdku, pinna-èlaki-chettu, babassa,<br>bokkudwckettu, bokhudu (Elliot), TEL.; Von-de-lagd, KAN.; Kutakan,<br>kodagam, MALAY.; Minkhud-bin, BURM.; Hingotukola, SING.; Mandu-<br>kaparn>, bheka-parni, S.\ns.; Artdniyde-hindi, ARAB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                  |
| <ul> <li>References —Roxb., Fl. fnd., Ed. C.B.C., 270,• Dalz. &amp; Gibs., Bomb-FL, 105; Wall, Cat., 560; Kurst, in Journ. As. Soc, 1877, PU II., n3; Rheede, Hort. Malab., X., t. 46; Elliot, Fl. Andhr., 29,153; Mason, Burma and Its People, 502; Taylor, Topography ofDacca, 58; Pharm. Ind. 107, 448; Ainslie, Mat. Ind., II., 473; Moodeen Sheriff, Supp. Pharm-Ind., 158; U. C. Dutt, Mat. Med. Hind., 176, 30g; Dymock;,Mat. Med. W-Ind., 2nd Ed., 36r; Flitck. &amp; Hanb., Pharmacog., 297; U. S. Dispense 15th Ed., 1666; Bent. &amp; Trim., Med. PI., 117; S. Arjun, Bomb. Drugs, 61; Waring, Bazar Med., 6g; K. L. Dev, Indig. Drugs of India, 62; Journal de Pharm., July 1855, 49; Dr. Clement Daruty de Grandpré, in the Nouveaux Remedies, April 8th, 1889, <sup>4</sup> i Hunter, Madras Med. Rep., 1855, 356; Waring inPharm. 7ourn., XVII., Ser. /., 3i2; Atkinson Him. Dist., 3i6;Drury, U. VI., 250; Lisboa, U. PI. Bomb., 260; Birdwood, Bomb. Pr., 41; Christy, Com. PI. and Drugs, VII., 52; VIII., 4, S8; Darrah, Rrp. on Condition of the People of Assam; Atkinson, Ec. Prod., NW. P., Pt. V., 95; Balfour, Cyclop., II., i37; Kew Off. Guide to the Mus. of Ec. Bot., 73; Report by Mr. D. Hooper, Govt. Quinologist, Madras; Gazetteers'.—Mysore and Coorg.!., 61; North-West Prov*, IV., Ixxii.; Bomb., VI., 14; XV., 43s; District Manuals, Cuddapah, 200.</li> <li>Habitat.—A small herbaccous plant, found throughout India, from the Himalaya to Ceylon at altitudes up to 2,000 feet, particularly abundant in damp places in Bengal; a common weed in the vicinity of Calcutta. It is also distributed to Malacca.</li> </ul> |                                                  |
| Is also distributed to Malacca.<br>History.—The plant was known to Sanskrit writers'of very remote<br>times, its properties being supposed to resemble those of <i>Brahmi</i> (Herpes-<br>tss Mpnniera), both being regarded as alterative, tonic, and useful in<br>diseases of the skin, nervous system, and blood. Dr. Dymock, however,<br>believes the word <i>Brahmi</i> to refer in Hindu and Sanskrit literature to the<br>Hydrocotyle, owing to the fact that it is applied in Bombay to that plant.<br>The earliest European writers on Indian Materia Medica, Rheede, Rum-<br>phius, and Ainslie, were all acquainted with the medicinal properties of<br>the plant as an alterative, tonic, and astringent, but it was not till Boileau<br>in 1852 made known its virtues in the treatment of leprosy, that the drug<br>came under special attention. In 1885 Dr. Hunter experimented with it<br>for the same disease in Madras, with sufficiently satisfactory results to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                  |

| HYDROCOT          | YLE The Physiology and Therapeutic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| asiatica          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| HISTORY.          | bring about its admission as an officinal drug into the Indian Pharma-<br>copocia. Of late years attempts have been made to introduce the plant<br>into European medicine, but up to this time it has not appeared in<br>the Pharmacopoeia of the United States, or that of Great Britain,<br>MedidneThe parts of the plant generally employed are the lea and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MEDICINE.         | deprived of their periodes, dried by exposure to the air in the shade, hod<br>ground to a powder. It appears that if dried in the sun, or by any meiner<br>of artificial heat, the leaves lose a great part of their medicinal properties,<br>owing to the volatilisation of the oil which is their active P <sup>tmct</sup> P <sup>e</sup> . The<br>powder thus carefully prepared ought to be kept in well-stoppe*d DOTW<br>to prevent the access of moisture. When fresh, Jhe leaves have scarcely<br>any smell, but emit a peculiar faint, aromatic odour when crushed oerwegi<br>the fingers. They have a harsh, bitter, and disagreeable taste, wmcn<br>however, becomes scarcely perceptible after the leaves have been we<br>dried. The powder, 3^ to 4ft of which may be obtained from 30IB or ui<br>fresh leaves, is of a pale green colour, and exhales a slight characterisu<br>aroma. It appears possible that a mistake has been made in on y<br>employing the leaves in the Indian Pharmacopoeia, since Boileau particu-<br>larly mentions that the entire plant (roots, twigs, leaves, and seeds) ough<br>to be used, and as will be seen below, the supposed active principle Vellann<br>is said to exist principally in the roots.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Chemistry.<br>489 | CHEMICAL COMPOSITION.—A careful analysis of hydrocotyle was maae,<br>in 1855, by Lepine, a pharmacien of Pondicherry, who found that it $y^{16''t}$<br>ed a body which he called <i>vellann</i> , from <i>valdrai</i> , the Tamil nam <sup>6</sup><br>of the plant, and regarded as its active principle. This <i>vellann</i> was<br>said to exist in the dry plant to the extent of o-8 to 1 per cent., to DC<br>an oily, non-volatile fluid, with the taste and smell of fresh hydroco-<br>tyle and to be soluble in spirits of wine, ether, caustic ammonfa, and parfuj<br>also in hydrochloric acid. The authors of the <i>Pharmacographta</i> , 1jowwr.<br>remark, "these singular properties do not enable us to rank <sup>1</sup> *''' <sup>1</sup> ''' ? <sup>1</sup><br>any well-characterized class of organic compounds," and, moreover, tneg<br>did not succeed in obtaining anything like it from the dried plant (pre-<br>sumably the officinal parts only, <i>viz.</i> , the leaves, were employed in the<br>analysis), but " simply a green extract almost entirely soluble in warm<br>water, and containing chiefly tannic acid, which produced an abundam<br>green precipitate with salts of iron." In a very recent note on Hydroco-<br>tyle, by Dr. Clement Daruty, however, <i>vellarin</i> is described, and ap<br>plears to have been again obtained. He remarks: " <i>vellarin</i> is an in<br>spissated oil of a pale yellowish colour, with a bitter, pungent, and persist<br>ent taste and a marked odour of Hydrocotyle; but which is subject to<br>variations under the influence of heat, humidity, and even of the atmo<br>sphere, volatilising at 120°C. It is soluble in alcohol. Of this active princi-<br>ple the plant contains 47 per mille. There are also found in it two re<br>sinous ingredients, one green, in the proportion of -085 per mille, the othe<br>brown, in the proportion of 3 per cent., and traces of tannic acid. <i>Vellart</i><br>is obtained principally from the roots of the plant." It would thus appea<br>that as the analysis of the plant at present is understood, it contains <i>Vellaf</i> ,<br>in much smaller amount than that obtained by Lepine, chiefly in the root<br>a part of the plant at present not officinal in India. |

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#### Action of Vellarin.

(J. Murray,) HYDROCOTYLE

<del>asiatica</del>. MEDICINE. PHYSIOLOGICAL ACTION.-M. Clement Daruty, in the note above al-Physiological Action. luded to, gives an interesting account of the effects of the drug on lepers, and on his friend, Dr. Boileau, who experimented on himself. The following 490 translation of his remarks may be here given, as his investigations afford the latest and most complete account of the physiological action of the Hydrdcotyle is a sensation of warmth and fingling of the skin, especially that of the extremities, followed after some days by a general increase in the temperature of the body, amounting in some instances to an intolerable itchiness«accompanied by cutaneous redness. The capillary circulation is accelerated and the pulse becomes stronger and fuller. After a week's treatment, the patient's appetite sensibly improves and the functions of the principal viscera are performed more easily. As the result of a more prolonged treatment, the skin becomes more supple and uniform, the epidermis gradually peels of! in small scabs, or, in severe cases, in large scabs, perspiration is restored, the excretory functions resume their normal action, the digestion becomes improved, and the appetite increases. Administered experimentally in small doses to healthy persons, it produces, within a short space of time, diuretic effects, then a general stimulation of the circulation, and eventually intense itching. In doses of i to 2 grammes of the powder it produces considerable giddiness, accompanied by cephalalgia, which sometimes lasts for a whole month, even after the medicine has been discontinued. It has also been known to give rise to dangerous dysenteric symptoms. Thus Dr. Boileau who, in treating himself, progressively increased the dose, found that after two months the drug had produced all the effects of a vio-lent, cumulative poison. He writes,' Yesterday in the morning I was seized with a violent trembling, so severe that I was forced to lie down in bed, and in spite of the many blankets with which I covered myself, it was more than an hour before I could recover the warmth of my body. « But this was unimportant in comparison with what followed. The other symptoms were violent, spasmodic contraction of the larynx, which made me believe suffocation to be imminent, palpitations of such violence and frequency, as to make me fear a rupture of the heart, and tetanic spasms of the trunk and limbs. Towards evening a fit of vomiting and haemorrhagic diarrhoea supervened, which soon abated and finally disappeared. I awoke in the morning free of dangerous symptoms, and with no result of the attack remaining, save a state of intense lassitude and a slight pain in the neck.<sup>9</sup> " To sum up it would appear that Hydrocotyle, properly prepared and administered, is a powerful stimulant of the circulatory system, its action chiefly affecting the vessels of the skin and mucous membranes. In larger doses it is a stupefying narcotic, and in some cases produces cephalalgia or vertigo with a tendency to coma.

APPLICATIONS IN MEDICINE.—The principal value of the drug appears Applications. from its physiological action to be as a stimulant to the cutaneous circulation in skin diseases, and for this purpose it will be found to have been chiefly employed. Though itappears to have no specific effect in leprosy nor iii syphilis, there can be little doubt that by its action in stimulating circulation it is of value in these affections. Dr. Shortt speaks of the drug in high terms, and considers it to have a powerful action in all leprous affections, but later writers agree that its effects are most marked in the preliminary anaesthetic stages of the disease. Drs. Lolliot, Cazenove, and Bert in find it of little value in advanced cases of tubercular leprosy, but extol its virtues in the treatment of chronic and obstinate eczema, the latter remarking : "The eczemas treated by me with the preparations of Hydrocotyle were of the most rebellious type, vie., localised eczemas; nevertheless cures were effected in every case and that within a very brief space of time." It

| HYDR9C9TY<br>asiatica.      | TLE Pharmaceutical preparations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| MEDICINE.                   | has also been prescribed with excellent result in cases of secondary and ter-<br>tiary syphilis, accompanied by gummatous infiltration and ulceration; in<br>chronic and callous ulcers; as a stimulant to healthy mucous secretion in in-<br>fantile diarrhoea and ozcena; in cases of scrofulous ulceration, enlargement of<br>glands and abscess; and in chronic rheumatism. It has also been em-<br>ployed with success as a diuretic in several diseases, and as an em-<br>menagogue in cases of amenorrhoea. In all cases in which a constitu-<br>tional or general disease is accompanied by a local lesion, the drug<br>ought to be not only administered internally, but also applied locally as a<br>powder, poultice or ointment. Numerous descriptions of cases so treated by<br>practitioners in many parts of the world have appeared of late years, with<br>the result that the use of the plant is becoming daily more wide-sDread,<br>and the belief in its therapeutic value more universal. Under these cir-<br>cumstances it would certainly seem advisable to give the whole plant a care-<br>ful trial, as recommended by Boileau, and more recently again strongly<br>advised by Daruty, as it is quite possible that much of the disrepute into<br>which it has fallen in India may be the result of the Pharmacopoeia recog-<br>nising only the least active part, <i>vie.</i> , the leaves. |
| Preparations.<br><b>492</b> | PHARMACEUTICAL PREPARATIONS.—The <i>Indian Pharmacopoeia</i> describes only two, <i>viz.</i> , POWDER OF HYDROCOTYLE to be dusted on ulcerated surfaces, or given internally in doses of from 5 to 8 grains thrice daily; and HYDROCOTYLE POULTICE, a stimulant application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Powder.                     | Dr. Daruty recommends several preparations; (1) THE POWDER pre-<br>pared from the LEAVES and ROOTS together, by washing the latter, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| ,493                        | drying all in a well-ventilated room, completely shaded from the sun. He                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Leaves                      | advises that a dose of 10 grains be given three times a day. Dr. Boileau                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| P494                        | recommends the following doses of the same powder in cases of leprosy, for an adult of 20 to 40 years of age and proportionately less for a child:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Soots.<br>495               | "20 grains#to be taken daily for two weeks, the dose to be then increased<br>by weekly increments of 5 grains up to 60 grains, at which daily rate it is<br>to be continued for one month. It should then be reduced by 5 grains<br>a week till it is again brought down to 10 grains, after which the treatment<br>should be suspended for an entire month " (to guard against the cumula-<br>tive poisonous action of the drug). •• It should then be resumed and pro-<br>gressively increased and diminished according to the sliding scale detailed<br>above. The powder should be taken before going to bed, in hot wine<br>sweetened, but on reaching 30 grains it is better to divide it into two equal<br>portions, one to be taken in the morning, the other in the evening." (2) THE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Plaster.                    | PLASTER is prepared from the leaves by trituration with <i>cold</i> water in a mortar, sufficient of the latter being added to form a thick paste. A stimu-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 496<br>Syrup.               | lating application. (3) THE SYRUP is prepared from 90 grammes of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                             | powder boiled in a quart of water, till the liquid is reduced to a pint, to<br>which 2ft of sugar is added and thoroughly mixed at 31 °C. till a syrup is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| " <b>497</b><br>Ointrient.  | formed. Dose, one teaspoonful, increased in the same ratio as Boileau                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Fluid<br>Extract.           | recommended for the powder. (4) THE OINTMENT.—Four grammes of the powder mixed with 30 grammes of vaseline. (5) THE FLUID EXTRACT.—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>499</b> Decoction        | Prepared so that one ounce represents one ounce of the powder. Dose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 500                         | 10 to 15 drops thrice a day. (6) THE DECOCTION.—Prepared from 30 grammesof the dried plant to one pint of water. (7) BATHS are employed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Baths.                      | advantageously in skin diseases, 1,500 grammes of the fresh plant being                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 501                         | added to the hot water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                             | SPECIAL OPINIONS.—§ "Is largely used in brain affections and in-<br>sanity. A decoction of the leaves is evaporated with butter and the result<br>ing preparation is then given internally * (Surgeon-Major Robb, Civil Sur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

*geon, Ahmedabad*). "This drug deserves attention. Its efficacy is well reported on. I have used it with great success in secondary and text of r

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| $\mathbf{A} = \mathbf{A} = \mathbf{A}^{\dagger} = \mathbf{A}^{$ | GROPHILA<br>licifolia.      |
| syphilitic skin affections. Its efficacy in these, cases is well marked"<br>(U. C. Dutt, Civil Medical Officer, Serampore). "A very useful alterative<br>in constitutional syphilitic ulcers and skin disease. Dose, 5 to 10 grains of<br>powdered leaves. Externally stimulant" {Thomas Ward, Apothecary,<br>Mndanapalle, Madras). "Much used in the hospital, similar to Calo-<br>tropis; and always combined with it. A valuable alterative tonic used in<br>all cas%s of leprosy and obstinate forms of skip diseases. The following<br>formula is employed here. Pulvis Calotropis, grains iii, Pulvis Hydroro-<br>"tyle grains x., twice a day. At times combined with iron preparations"<br>(J. G. Ashworth, Apothecary, Kumbakonom, Madras).<br>Trade.—Of recent years enquiry for the plant has been made in India<br>which has led to its cultivation on a small scale in gardens near Bombay, in<br>the neighbourhood of which town, Dr. Dymock remarks, the plant is rare in<br>a wild state. Should any increased demand arise, Calcutta, near which the<br>plant abounds as a common weed, would probably become the source of<br>supply. The trade value of the dry herb in Bombay is given by Dr.<br>Dymock as R7-9 per Surat maund of 37£fb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | medicine.<br>trade.<br>502  |
| Food.—The LEAVES are sometimes made into a soup, which, however, probably serves more as a medicine than as a food.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FOOD.<br>Leaves.            |
| <b>HYDROLEA</b> , <i>Linn.; Gen. PL, IL</i> , 831.<br>The single Indian genus of the HYDROPHYLLACE <sup>^</sup> , a Natural Order closely                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 503                         |
| allied to the GENTIANACE^E.<br>Hydrolea zeylanica, Vahl.; FL Br. Ind., IV., 133; Wight, ill., u<br>1167, & Ic, t. 601; HYDROPHYLLACEJE.<br>Syn.—HYDROLEA JAVANICA, BL; NAMA ZEYLANICA, Linn.; NAMA, Linn.<br>Vern.—Kasschra, isha-langulya, BENG.; Tsjerwvallel, MALAY.; Deya-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 504                         |
| <ul> <li>kirilla, SING.; Langali, SANS.</li> <li>References.—/?<sup>^</sup>., FL Ind., Ed. C.B.C., 26\$; Thwaites, En. Ceylon PL, 209; Dalz. &amp; Gibs., Bomb. FL<sub>i</sub>70; Wall, Cat., 43g8; Rheede, Hrrt. Malab.,X.,28; Works of Sir W. Jones, VI., 106; CSkaughnessv, Beng. Dispens., 507 f Druw, U. PL, 251; Balfour, Cyclop., II., i37; Treasury of Bot., /., 606; Gazetteers:—NW. P., I., S3: IV<sub>2</sub>.lxxiv; Bombay, m XV., 438.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | **                          |
| Habitat.—A procumbent, branched herb, abundant in wet and marshy<br>places throughout India, ascending to an altitude of 4,000 feet.<br>Medicine.—The LEAVES, beaten into a pulp and applied as a poultice, are<br>considered to have a cleaning and healing effect on neglected and callous<br>ulcers. They apparently possess some antiseptic property.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | MEDICINE.<br>Leaves.<br>505 |
| HYGROPHILA, Br. ; Gen. PL, IL, 1075.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |
| A genus of herbs of the Natural Order AcANTHACEE, comprising eighteen<br>tropical and sub-tropical species, of which eight are Indian.<br>Hygrophila salicifolia, Nees; FL Br. Ind., IV., 407; Wight, Ic, t.<br>\_1490; ACANTHACEA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 506                         |
| <ul> <li>Syn.—RUEILIA SALICIFOLIA, Vahl.; R. LONG I FOLIA, Roth.</li> <li>Var. assurgens. SY<sub>N</sub>. HYGROPHILA ASSURGENS, Nees, excl. syn. and ViXr% 0/ <sup>H</sup>» RADICANS, Nees; RUELLIA RADICANS, Wall.</li> <li>Var. dimidiate. SYN. H. DIMIDIATA, OBOVATA, and UNDULATA, Nees.</li> <li>Vern —Mathom arak\ SANTAL ; Lai pin kha, BURM.</li> <li>References Roxb., FL Ind., Ed. C.B.C., 47s; Thwaites, En. Cevlon Pi, 225; Dale. &amp; Gibs., Bomb. FL, 184; Wall. Cat., 2373, 2410, 71'so, Rev. A. Campbell, Cat. Ec. Prod., Chutia Nagpur<sub>9</sub> No. 8226.</li> <li>Habitat.—Herbs from 1 to 3*feet in height, very common throughout India and Ceylon. Var. assurgens is a native of Eastern Bengal and Mal. #• acca; var. dimidiata of Prome and Mergui,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             |

| IYGRORYZ<br>aristata.                                                    | ZA Hygrophila.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FOOD.                                                                    | Food.—The LEAVES are eaten as a pot-herb by the Santals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Leaves. 507 3                                                            | Hygrophila spinosa, T. And.; FL Br. Ind., IV., 408; Wight, Ic, L 449<br>Syn.— H. LONGIFOLIA, Kurs; BARLERIA LONGIFOLIA, Linn.; B. HFXA<br>CANTHA, Mori; RUELLIA LONGIFOLIA, Roxb.; ASTERACANTHA LONG                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                          | <ul> <li>FOLIA, Nees.; A. AURICULATA, Nees.</li> <li>Vern—Tdlmakhdna, gokhula kanta, gdkshura, HIND.; Kulidkhdrd, han takalika, BfcNG; Tal-makhana, kanta kalika, BEHAR; Gokhula janun SANTAL; Tdlimkhana, kolsunda, BOMB.; Tdlimakkdna, MAR.; Ekhar gokhru, Guz.; Nirmalliy TAM.; Nirguvi veru, TEL.; Kalavankabiji KAN.; Bahel-schulli, MALAY; Katre-iriki, SING.; Ikshugandhd, kok Idksha, SANS.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 475; Tkwaites, En. Ceylon PL 22S; Dais. &amp; Gibs., Bomb. FL, 189; Aitchison, Cat. Pb. andSind PL, ill Kura in Journ. As. Soc, 1870, II., 78; Wall., Cat., 2505; Rheede, Hot Malabo II., t. 45; Rev. A. Campbell, Ec. Prod, Chutia Nagpur, N 8450; Pharm. Ind., 162; Ainslie, Mat. Ind., II., 236; U. C. Dutt, Ma Med. Hind., 215, J05/ Dymock, Mat. Med., Patna, 110; Atkinso Him. Dist., 315; Birdwood, Bomb. Pr., 67; Home Dept. Cor., 225, 230</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MEDICINE.<br>Plant.<br><b>509</b><br>Joot.<br><b>510</b><br>Seed.<br>511 | GazetteersBombay, VI., 14; NW. P., IV., Ixxvi.<br>Habitat.—A small spiny bush, common in moist places everywhen<br>throughout India from the Himalaya to Ceylon.<br>Medicine. The WHOLE PLANT, ITS ROOT, and SEED, are the par<br>used medicinally. Their value has been long recognised both by Sanskr<br>and Muhammadan writers, the former classing the plant as cooling an<br>diuretic, and employing the whole herb, or its ashes, and the roots, as<br>cooling medicine and diuretic in cases of hepatic obstruction, drops<br>rheumatism, and diseases of the genito-urinary tracts; while the latte<br>employ it in the same way, but also consider the seeds aphrodisiac. In<br>native practice to the present day they continue to be employed for the<br>same purposes, and the seeds may be found in almost every bazar. The<br>attention of Europeans was first drawn to Hygrophila by Rheede, where<br>wrote that a decoction of the root, in doses of half a tea-cupful twice dail<br>was employed by the natives on the Malabar Coast as a diuretic<br>"dropsy and gravelish diseases." Since that date Ainslie, Kirkpatr<br>and 6ioson have borne testimony to its diuretic properties. The diffe<br>ent parts of the plant appear to have the following therapeutic actions.<br>The seeds are demulcent, diuretic, and possibly tonic, and are therefore indi-<br>cated in diseases of the genito-urinary tract. The roots are cooling, bittle<br>tonic, and diuretic, and the leaves, cooling and diuretic. The seeds ma-<br>be prescribed in doses of 10 grains to 2 drachms in infusion; and the roo-<br>or whole plant in doses of 1 to 2 ozs. daily, of a decoction prepared from<br>the seeds are demulcent. |
| trade.<br>512                                                            | one ounce of the drug and one pint of water boiled down to 14 ozs.<br>SPECIAL OPINIONS.—§" The leaves are boiled overnight and take<br>next morning in cases of dropsy. It is a good diuretic" (Surgeon 'F. Thomas, 33rd Madras Native Infantry, Mangülore). <sup>th</sup> Found usef<br>as a diuretic in dropsical affections. Preparations :—Take of Hygrophi<br>fresh roots one ounce; water ten ounces. Boil for fifteen minutes "i<br>covered vessel and strain. Dose from 1 to 2 ounces. Invariably used<br>combination with other diuretics " (J. G. Ashwortli, Apothecary, Kumb<br>konum, Madras).<br>Trade.— Dr. Dymock states that the seeds alone form an article<br>commerce in Bombay, and fetch Re per maund W <sup>+</sup> ft <sup>+</sup><br>HYGRORYZA, Nees; Gen. PL, III., it 16.<br>A small genus belonging to the tribe ORYZEJE, of the Natural Order GRA-<br>MINEJE, having-only one species, and that confined to India.<br>H. 512                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| The "Wild Rice." (1. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DICTYON                         |
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| exce                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <u>lsum.</u>                    |
| <ul> <li>HygToryZa aristata, Neesj Duthie, Fodder Grasses of N. India, 20;</li> <li>SynLEERSIA ARISTATA, Roxb. [GRAMiNEa.<br/>VcrnJangli dal, HIND.; Passai, passari, passdhi, par šal, tinni, NW.<br/>P.; Pastdl, PB.; Nir-valli-pullu, MALVY.; Goj'abbd, SING.<br/>References —Roxh., FL Ind., Ed. C.B.C., 308; Thwaites, En. Ceylon PL,<br/>3s6; Aitchison, Cat. Pb. and SindPL JS7; Rheedet Hort. Mal.g TO, t.<br/>12; Duthie, Grasses of NW. India, 12; Duthie &amp; Fuller, Field and<br/>Garden Crops, 16.</li> <li>HabitatAn aquatic grass, found either floating on the surface of<br/>water, or creeping on wet ground, frequent in most parts of the plains of</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 513                             |
| India. The grain ripens in September.<br>Food and Fodder The grain, which in Bengal is called "wild rice,"<br>is eaten by certain of the poorer classes, who collect it by sweeping the<br>heads of the grass with baskets. Roxburgh says that cattle are fond of the<br>plant.<br>HYMENOCARDIA, Wall.; Gen. PI, III., 283.<br>A genus of shrubs or trees belonging to the EupHORBiACEiE, and com-<br>prising five species, natives of Tropical India, the Malay Archipelago, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FOODJc<br>FODDER.<br><b>514</b> |
| Africa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                 |
| <ul> <li>Hymenocardia punctata, Wall.; FL Br. Ind., V., 377, EUPHOR-<br/>Syn.—HYMENOCARDIA WALLICHII, Tulasne; SAMAROPYXIS ELLIPTIC A,<br/>Miq.</li> <li>Vern.—Ye-hin, BURM.</li> <li>References.—Kurs, For. FL Burm., II., 394; Gamble, Man. Timb., 3fl.</li> <li>Habitat.—A deciduous shrub or small tree common in the swamp forests<br/>and along the marshy borders of choungs in the savannahs, from Pegu<br/>and Martaban down to Tenasserim; also found in Upper Assam By<br/>Griffith.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 515                             |
| Structure of the Wood.— Rather heavy, of unequal fibres pale brown, becoming red brown on exposure; rather hard and brittle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TIMBER.<br><b>516</b>           |
| HYMENODICTYON, Gen. PL, II., 35.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                 |
| A qenus of trees or shrubs belonging to the Tribe CINCHONE/E, of the<br>Natural Order RuBiACEiE, and comprising four to five species, natives of<br>Tropical Asia and Africa. [/,, /. jg <sub>y</sub> So ; RuBIACEJB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                 |
| <ul> <li>Hymenodictyon excelsum, Wall.; FL Br. Ind., III., JJ; Wight,<br/>Syn.—HYMENODICTYON THYRSFLORUM, Wall; H. UTILE, Wight; H.<br/>OBOVATUM, Wight; H. HOKSFIELDIANUM, Miq.I CINCHONA EXCELSA,<br/>Roxb.; C. THYRSI FLORA, Roxb.</li> <li>Vern.—Bhaulan, bhalena, bhamina, dhauli, kûkûrkat, bhûrkür, phaldu,<br/>bhohdr, potûr, bandar A, phargur, HIND.; Bodoka, konoo, URIYA •<br/>Salt, KOLJ Bhorkhond, SANIALJ Kukurdt, bhürkür, NW. P.; Bartul<br/>harthoa, thab (?) manabina, PB.; Bohar pdttr, putür, C. P.; Dondru<br/>dandelo, PANCH MEHALS; Kald-kadu, BOMB.; BhoursJI, MAR.)<br/>Bandart; jangli-andr-kd-jhar, DEC; Sagapu, vildri,TAM.; Dudiyetta,<br/>dudippa, chetippa, b&amp;rja, banddra, TEL.; Bandar ay anni, KAN.; Valldri,<br/>MALAY.; Khoyari, kusan, BURM.; Burkunda, BHUMIJ.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 178 s Brandts, For. FI<br/>267 ; Kurz, For. FI. Burm., II., 71; Gamble, Man. Timb., 22d 22c *<br/>Source, Conso., pomor, 197; Stewart, ro. rr., 195; REO. A. Lampbell,<br/>Ec. Prod. of Chutia Nagpur, No. 7585; Elliot, FI. Andhr., 21, 32, 37;<br/>Pharm. Ind., 117 ; Ainslie, Mat. Ind., II., 341 ; O'Shaughnessy, Beng.<br/>Dispens., 394 ; Moodeen Sheriff, Supp. Pharm. Ind., 158 ; Dymoxb, Mat.<br/>Med. W. Ind., 2nd Ed., 404 ; U. S. Dispens., 15th Ed., 444 ; Athinson,<br/>Him. Dist., 311, 739 ; Drury, U. Pl., 235 ; Lisboa, U. Pl. Bomb., 84, 240,<br/>778 ; Indian Forester, III., 203 ; IX., 438 ; X., 325 ; XII., App., 4 ; Kew<br/>Off. Guide to the Mus. of Ec. Bot., 81 ; For. Adm. Rep. Ch. Nagpur,<br/>1885, 31 ; Gaseteers :Mysore &amp; Coorg, 111., 28 ; NW. P., IV., Izxiiii.</li> </ul> | 517                             |

# HYMENODICTYON

\_\_excelsum\_\_\_

A Useful Febrifuge and Antiperiodic.

Habitat—A large deciduous tree, 30 to 40 feet high, met with on the dry hills at the base of the Western Himálaya, from Garhwál to Nepál, ascending to 2,500 feet; and throughout Chutia Nagpur and the Central Provinces to the Deccan, Central India, and the Anamalays; also found in Tenasserim and Chittagong.

Dye and Tan.—The Rev. A. Campbell writes that the LEAVES are employed as a dye by the Santals, but he does not state the colour produced. Ainslie mentions that the BARK, which has powerfully astringent properties, is used by tanners, a statement which is repeated by Lisboa.

Medicine.—The inner coat of the bark, like that of the true cinchonas, is bitter and astringent, and has been long employed by the Hindus as a febrifuge and antiperiodic, especially in cases of tertian ague. Roxburgh commenting on this writes: "The infusion of one fresh leaf in water all night had little taste, but struck quickly a deep purplish blue with a chalvbeate. The two inner coats of the bark (the outer light spongy stratum is tasteless) possess both the bitterness and astringency of Peruvian bark, and I think, when fresh, in a stronger degree. The bitterness is not so quickly com-municated to the taste on chewing the bark as that of the former, but is much more durable, and chiefly about the upper part of the fauces." Since the above was written the bark has attracted the attention of many European Chemists and Scientists, who have naturally been hopeful of discovering in it alkaloidal elements similar to those existing in the true cinchonas. The *Pharmacopoeia of India*, published in 1868, contained the name of the plant amongst its non-officinal drugs, and the author of the article recommended that, " in all future inquiries into the subject, this The bark should be one of the first to which attention should be directed." first chemist who appears to have made an analysis was O'Shaughnessy, who found that, notwithstanding the excellent antiperiodic effects yielded by use of the drug in his hands, a specimen obtained from the Calcutta Botanic Gardens contained no alkaloid.

In 1870 an analysis was again made by Broughton, who found that the bitter taste was due to the -existence of *eesculin*, a substance which, when the bark became dry, underwent transformation into asculetin, an almost tasteless compound. Dr. Dymock, commenting on this analysis, suspects that the bark actually examined was that of H. oboyatum, not that of H. excelsum, as the latter, when dry, is extremely bitter. The latest analysis, one which has apparently definitely settled the question of the chemical constitution of the bark, was performed by M r. W. A. H. Naylor in 1883. Of this the following summary is given by Dr. Dymock; " It appears that the bitter principle is not the glucoside *eescultn* nor its decomposition product, cesculetin, but an alkaloidal substance. That as such it is allied to quinoidin, berberin, and paracin. From *qmnoidtn* it differs in being optically inactive, and from its double compound containing relatively less platinum; from bsrberin it differs in that it contains a higher percentage of carbon, while its double compound also yields a larger amount of platinum; and from *paricin* it differs only in the percentage of hydrogen it gives. Mr. Naylor considers it to be a new alkaloid having a composition corresponding to the empirical formula C<sub>%4</sub> H<sub>40</sub> N<sub>3</sub>, and therefore to be an addition to the small class of bases devoid of oxygen. Besides "Hymenodictyonine," which is the name given to the new alkaloid, Mr. Naylor has separated a bitter neutral principle, represented by the formula  $C_M$  H<sub>43</sub> O<sub>10</sub>, which he thinks may be a decomposition product of a glucoside. Mr. Naylor has since succeeded in obtaining hymenodictyo*nine* in a crystalline form, by extremely slow evaporation of its ethereal solution. When placed in contact with cold sulphuric acid the solution by transmitted light assumed a lemon-yellow colour, passing to a wine red, H. 520

DTE & TAN. Leaves. 518 Bark. 519 MEDICINE. Bark. 520

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Henbane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (J. Murray,) HY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | OSCYAMUS       |
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| <b></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | niger.         |
| and it is apparently a tertiar<br>close analogy with those of i                                                                                                                                                                                                                                                                                                                                                                                                                                                 | lifficult to burn off the<br>l figures which agreed<br>, estimation of the ch<br>lkaloid, and in the co<br>es to be dibasic with<br>y diamine. Its chern<br>nicotine.''<br>to have been made to<br>kaloid or of the bitto                                                                                                                                                                                                                                                                                                          | e carbon, but combustion<br>d with those deduced from<br>dorine in the double salt,<br>omposition of its diethyl-<br>h the formula $C_{23}$ H <sub>40</sub> N <sub>2</sub> ,<br>nical properties display a<br>o determine the therapeu-<br>er neutral principle when                                                                                                                                                                                                                                                                                                                                                                                                                          |                |
| Fodder.—The LEAVES are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | —-Fine, close-graine<br>foot. It is employe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ed, of a pale mahogany<br>ed for making agricultural                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>521</b>     |
| Hymenodictyon obovatu<br>Vern.—Karvi, kari, CH<br>malla kai, TAM.; Mau<br>References.—Brandtš,<br>& Gib*., Bomb. Fl., A                                                                                                                                                                                                                                                                                                                                                                                         | I. NAG.; Karwai (bitt<br>Uui tandk, MADURA.<br>For. FL, 268; Bedda<br>117; Lisboa, U. PL Bo                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>[Ic, t. 1159.</b><br>. Ind., Ill, 36; Wight,<br>erness), <i>strid</i> , BOMB.; Yella<br>ome, Fl. Sylv., t. 219 / Dale.<br>mb., 85; For. Admins. Rep.<br>111., 23f Gazetteer, Bombay,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 523            |
| Habitat.—A handsome to Travancore.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -Pale, mahogany-col<br>mber is used by the n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TIMBER.<br>524 |
| HYOSCYAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | U <b>S,</b> Linn.; Gen. I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PL, II., 903.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |
| A genus of erect, coarse l<br>ACE^E, and comprising nine sp                                                                                                                                                                                                                                                                                                                                                                                                                                                     | nerbs, belonging to the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Natural Order SOLAN-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |
| Hyoscyamus niger, Linn<br>HENBANE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | e.; Fl. Br. Ind.,I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | V., 244; SOLANACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 525            |
| »=seeds), HIND.; K<br>ajwdin, NW. P. ; D.<br>bavgidewdna {bazrul<br>Damtura, SIND.; K<br>Khórdsdni-v6vd <sub>9</sub> MA<br>sdni-yomam, T AM.;<br>sdni-vómd, khurdsdm<br>6anj, ARAB. ; Bazrul<br>References Roxb., H<br>Gibs., Bomb. FL Sup<br>IV., 2g4; Pharni. Ind<br>nessy, Bent;. Dispens<br>U. C Dutt, Mat. Med.<br>Ed., 629 ; Fluck. & J<br>t. 196; S. Arjun, Bon<br>Irvtne, Mat. Med.,<br>Oudh, 31; Year-boo<br>Dist., 739! Drury, U<br>Him. Bot., 280; Ro<br>Smith, Die, 211; Kew<br>of Agric. Dept., NV | horasaniajowan {bazr4<br>andúra, baerbang, den<br>banj=seeds in bazar)<br>(hurd^dni-ajvan, DE (<br>R.; Khordsani-ajmo, k<br>Kurdskdni-vdmam, ku<br>i-vddakki, KAN.; Pdra<br>bang, PERS.<br>FL Ind., Ed. Carey an<br>pL, 62 ; Stewart, Pb. F<br>L, 177, 460 ; Ainslie, M<br>s., 470; Moodeen Sher<br>Hind., 21r, 312; Dyta<br>Hanb., Pharmacog., 46<br>nb. Drugs, 97 ; Murray<br>Patna, 6; Med. Top.,<br>k, Pharm., 1876, 306;<br>J. PL, 252,- Birdwood<br>yle, Prod. Res., 237;<br>w Off. Guide to the Mu.<br>W. P., 1882, 20; Rep | ni, khurdsdni jamdni (bazrta<br>=seeds), BENG.; Khorasdm<br>(IUd, datūra, stir a, damtāra<br>, Telingchi, SIMLA; PB.<br>C; Khorasd' i-orva, BOMB.<br>chordsdni-ajvdv, Guz.; Kūrd-<br>vinji vdmam, TEL.; Khurd-<br>sikaya, mdni, SANS.; Bazru<br>d Wall., II., 1237 ; Dale. &<br>CL, 156; Boissier, FL Orient.,<br>Aat. Ind., I., 167; G'Shaugh-<br>iff, Supp. Pharm. Ind., 159,<br>ock, Mat. Med. W. Ind., 2na<br>3; Bent. & Trim., Med. PL,<br>p, PL and Drugs, Sind, 156<br>; Ajmere, 124; Med. Top.<br>1878, 288; Atkinson, Him<br>J, Bom. Pr., 6r; Royle, III<br>Balfour, Cyclop., II., i38<br>s. of Ec. Bot., 101 ; Repor<br>ort on Nilgiri Bot. Gardens<br>rden's Report, 1854; Specia. |                |
| <b>`</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Н. 525                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |

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### HYOSCYAMUS niger.

Cultivation of Henbane.

Reports/rout:—M. A. Lawson, Esq., Govt. Botanist, Madras; D. Prain, M.B., Roy. Bot. Gardens, Calcutta; Surgeon Genl. with Govt. of Bombay, 1888; Dr. Moodeen Sheriff, J. F. Duthie, Esq., Dir. Bot. Dipt., Northern India; D. Hooper; Esq., Govt. Quinologist, Madras; Govt. of Madras, 1882 j Gazetteers: - N.-W. P., 173; 11 •> /7J. Habitat.—A herb of the Temperate Western Himálaya from Kashmir to Garhwál, from 8,000 to 11,000 feet, distributed over Western and Northern Asia, Europe, and Northern Africa. CULTIVA-Cultivation.—The first record of the cultivation of Hyofcyamus in TION. India is made by Dr. Royle, in his Illustrations, I. c, in 1839. That author 526 remarks that Henbane, Datura Stramonium, and Nicandra indica(? Physalis minima, Linn., VAR. indica) were at that time successfully grown and converted into extract for the medical depots, in several stations in the plains of Northern India and in the Himalaya. He concludes his remarks as follows : " The extract of Henbane particularly was highjy approved of By several medical officers, and was pronounced by Mr. Twining, after trial in the General Hospital of Calcutta, to be of most excellent quality." Later records exist of its more or less successful cultivation in Calcutta, at the Royal Botanical Gardens, Saharanpur under Dr. Jameson, in the neighbourhood of Agra and Ajmere, in Bombay at Hewra and Dapuri, and in the " Nilghiris. The crops thus produced seem to have been almost entirely used in supplying the Government Medical depdts with leaves and extract, and no market with European druggists appears to have been formed. Thus in a report furnished by the Superintendent of the Botanical Gardens, Saharanpur, on the cultivation of Hyoscyamus during the past ten years, extract to the value of R 1,939 and leaves to the value of 62,186 are said to have been supplied to the Government Medical dep6ts, and an entry occurs to the effect that in 1882-83 leaves to the value of R4.0, and extract to the value of R30, were supplied to an European firm in Bombay, but since Chen no extension of trade with commercial firms has been made. The seeds^ of the bazar also appear to be principally imported from Persia and Afghanistan, so that at the present day all Hyoscyamus employed in European medicine, except by Government, comes from Europe, and even the seeds offered for sale in bazars are not obtained in this country. It is difficult to understand why this should be tli3 case. The plant grows wild abundantly on the Himalaya; it is fairly extensively cultivated, apparently with a considerable amount of success in various parts of the country, and the supply ought to more than equal the demand. It seems possible, however, that the plant artificially cultivated, as it is in the hot climates of Saharanpur and parts of Bombay, where the surrounding conditions are very different to those which the wild plant enjoys, may be deficient in some of the properties which render it medicinally valuable. It is, therefore, highly desirable that an accurate analysis of the Indian plant, in comparison with the European, and of the cultivated plant of the plains in comparison with the wild Himalayan stock, should be made. Such an analysis would definitely determine the relative values of each, and should it prove favourable, might afford a stimulus to the employment of the native drug, not only in India, but in other countries. The plant can be grown and the extract prepared so that the product may be sold much more cheaply than that imported from Europe. Thus the average rate at Saharanpur during the past ten years has been R1-4 per flb for the extract, and annas 4 per fl> for the leaf, while the last quotations in England for the latter is from *jod*. for foreign to 8s. per fij for English biennial, and for the former 6s.  $d. pf_r$  ft.

Oil.—The SEEDS are mentioned by Dr. Cooke as yielding an oil.^ Qr. Dymock describes a specimen he obtained from the Poona  $Boj_{an}|_{ca}I$ Gardens as bright yellow and rather thjcfc It is apparently not  $enJ_{D}|_{o}yed$  for any purpose.

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OIL. Seeds. 527

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| Madicing and Chamistry of Hanhang (1 Murray)                                                                                                                                                                                                                                                                                                                             | DSCYAMUS niger.                                                      |
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| 20 to 60 drops, and an extract, dose 5 to 10 grains, both prepared<br>from the leaves. In Europe dried henbane is sold in three forms: 1st,<br>the foliage and green toDs of the annual plant, 2nd, the leaves of the<br>first year of the biennial plant, and 3rd, the foliage and green tops<br>of the biennial plant; of these the last form is regarded as the best. | Foliage.<br>529<br>Green tops.<br>Seeds.<br>531<br>Chemistry.<br>532 |

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| HYPECOUM<br>Procumbens. Medicinal uses of Henbane.                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
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| <b>MEDICINE.</b><br>Physiological action.                                                                                               | PHYSIOLOGICAL ACTION.—Dr. John Harley, who has made special<br>investigations into the action of the drug under consideration, writes:<br>"Henbane, like belladonna, produces dilatation of the pupil, somnolency,                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| 533                                                                                                                                     | delirium The general action on the secretions and nervous system a state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
|                                                                                                                                         | in all respects with that of belladonna, and the results of its action is same; but the influence of henbane on the cerebrum and nerve cent less somewhat greater, while its stimulant action on the sympathetic is; both drugs directly stimulate the heart, but after moderate doses the area into of henbane results in a sedative effect. Small doses are sedative and $i \circ n_{\Lambda}^{c}$ to the heart; large doses excite its action, and excessive doses depression almost as readily as those of belladonna. Both drugs produce relaxant of the voluntary muscles, and of the occluding fibres of the in^pstine an bladder." |  |  |
| Uses.<br>534                                                                                                                            | MEDICINAL USES.— <b>Hyoscyamus</b> is especially valuable as <b>a</b> nervous, sedative, and narcotic in cases of maniacal excitement, sleeplessness, ana nervous depression. This action appears to be most largely due to the syrupy alkaloid above mentioned, $vig_{.t}$ Hyoscin, which may be admin <sup>'9</sup> "                                                                                                                                                                                                                                                                                                                    |  |  |
| 1                                                                                                                                       | tered alone, by hypodermic doses of $yj^{f}$ gr. or more of the Hydriodate.<br>The drug is also a valuable sedative in cases of cough, especially in the<br>early stage of bronchitis and in asthma, in cases of which its relaxing<br>effect on muscular tissue is highly beneficial. It is a decided laxative<br>and carminative, and appears to possess a peculiarly sedative effect m                                                                                                                                                                                                                                                  |  |  |
|                                                                                                                                         | irritable conditions of the genito-urinary system. As an external applica-<br>tion it has been employed in neuralgia and rheumatism, painful glandular<br>enlargements, irritable ulcers and haemorrhoids. In diseases of the eye its<br>sedative, anodynec and midriatic actions are most valuable. Mr. Duthi©<br>mentions the employment of henbane by natives near Saharanpur as an<br>ingredient in a massala administered to trotting bullocks during the not                                                                                                                                                                         |  |  |
|                                                                                                                                         | and rainy seasons, as a sort of •' condition powder."<br>SPECIAL OPINIONS.—§" I have found the tincture in drachm doses<br>in combination with Bromide of Potassium useful in cases of maniacal ex-<br>citement, sleep being produced " (Surgeon S.H. Browne, M.D., Hoshangabad,<br>Central Provinces), "The tincture of this has proved successful in three<br>cases of Ben Beri" (Surgeon W. F. Thomas, Madras Army, 33rd M. N-m ';><br>Mango lore). "A very useful anodyne, sedative, and antispasmodic.                                                                                                                                |  |  |
|                                                                                                                                         | (Surgeon G. Price, Shahabad). "I have found the extract very useful<br>in irritating cough accompanied with tenacious mucus in the air passage,<br>(Civil Surgeon W. Moir <sub>9</sub> Meerut). "Very useful in mania and m<br>delirium tremens" (Surgeon-Major E. G. Russell, Superintendent, Asylunis,<br>Calcutta).                                                                                                                                                                                                                                                                                                                     |  |  |
| FODDER.<br>Leaves.                                                                                                                      | Fodder.—The young LEAVES are said to be eaten by cattle.<br>Trade.—The value of the seed in Bombay is R7 per maund of 374.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |
| 535                                                                                                                                     | As already mentioned the leaves may be obtained at Saharanpur at an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
| TRADE. 536                                                                                                                              | average cost of 4 annas per ft, and the extract, carefully prepared, for Ri-4-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|                                                                                                                                         | HYPECOUM, <i>Linn.; Gen, PL, I.</i> , 54,9<>5-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| A small genus of the Natural Order FUMARIACEA, comprising four or five species, natives of the Mediterranean region and Temperate Asia. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| 537                                                                                                                                     | Hypecoum procumbens, <i>Linn.; Fl. Br. Jnd.</i> , 7., 120; FUMARI<br>THE HORNED CUMIN. [ACE*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|                                                                                                                                         | <b>References.</b> —Boiss., Fl. Or., /., 124; Aitckison, BoU of Afgh. Del<br>Com., 321 Pharmacog. Indica, /., 117; Dymock, Mat, Med. Wy<br>Jnd., 2nd Ed., 54; Murray, PI. and Drugs, Sind, 77.                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|                                                                                                                                         | Н. 537                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |

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| The "Magic Barlow" (I Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | rforating.                 |
| Habitat.—A low, annual weed of cultivation of the drier parts of the Panjab and the Salt Range, distributed to Western Asia and the Mediterranean Region.<br>Medicine.—Murray, in his <i>Plants and Drugs of Sind</i> , describes the horned-cumin as yielding a juice which has the same effect as opium, and its leaves as diaphoretic. The authors of the <i>Pharmacographia</i> are of opinion that it is the <i>VTTHKOOV</i> of Dioscorides and Hypecoum of <b>Pliny</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MEDICINE.<br>Juice.<br>538 |
| Hyperanthera Moringa, VahL, see Moringa pterygosperma, Gcertn.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Leaves.<br>539             |
| HYPERICUM, Linn.; Gen. PL, /., i6 <sub>5</sub> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| A genus of herbs, shrubs, or small trees, belonging to the Natural Order<br>HVPERICINE/E, and comprising 160 species distributed over the temperate<br>regions of the globe. Of these about 20 are Indian, natives of the hills,<br>especially the Himálaya, but very few are at present known to possess properties<br>>f economic importance. The writers of the <i>Pharmacographia Indica</i> state<br>that a plant exists in Persia described by Muhammadan writers as a species<br>of Hyelárikún (Hypericon) which is locally named <i>Dddi</i> and <i>Jao-i-jddú</i> , or<br>" magic barley," to which is ascribed the medicinal properties formerly attribut-<br>ed to the St. John's worts of Europe, namely, the power of expelling the demon<br>of hypochondriasis, and of acting as a charm against witch-craft. The red juice<br>of the flowers of Hypericum was also considered by ancient classical writers<br>to be a signature of human blood ; it was called <i>ayhpógaijiop</i> by the Greeks,<br>and was employed as an application to wounds. Several species are cul-<br>tivated as ornamental shrubs. [ <i>Jc.</i> , /. 9^0/ HYPERICINE2E. |                            |
| Hypericum Hookerianum, W. & A., Fl. Br. Ltd., I., 234; Wight,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5*0                        |
| <ul> <li>Syn.—H. OBLONGIFOLIUM, Hook.</li> <li>Var. Leschenaultii, Choisy ; H. TRIFLORUM, Blume; H. OBLONGI FO-<br/>LIUM, Wall.; H. CHOISIANUM, Wall.</li> <li>Vern.—Tumbomri, LEPCHA.</li> <li>References.—Gamble, Man. Timb., 21; List of Trees, Shrubs, &amp;c, of<br/>Darjilingt 6.</li> <li>Habitat.—A glabrous shrub from 6 to 8 feet in height, found in the<br/>Sikkim Himalaya from 8,000 to 12,000 feet; the Khasia mountains, from<br/>4,000 to 6,000 feet; and the Nilghiris.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ņ                          |
| Structure <b>of the Wood.</b> —Close-grained, moderately hard, with marked annual rings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TIMBER.                    |
| Arboriculture.—Gamble mentions that this shrub is frequently employed for hedges in Sikkim.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 541<br>ARBORICUL-<br>TURE. |
| <b>H. patulum,</b> Thunb. / Fl. Br. Ind., /., 254.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 542                        |
| SynHYPEKICUM URALUM, Ham.; H. OBLONGI FOLIUM, Wall, non                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 543                        |
| Choisy.<br>Var. attenuatum, Choisy.<br>Vern.—TumbhM, BEHARI.<br>References.— Irvine, Mat. Med. Patna, ri3; Atkinson, Him. Dist., 306.<br>Habitat.—A small glabrous shrub found throughout the Temperate<br>Himalaya (Sikkim excepted) from Bhotdn to Chamba and Simla, also<br>in the Khasia mountains and Yunan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
| Medicine—The scented SEEDS are employed as an aromatic stimulant<br>in Patna, to which they are imported from Nepal. Dose 2 to 10 grains;<br>price 2 annas per & ( <i>Irvine</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MEDICINE.<br>Seeds.<br>544 |
| H. perforatum, Linn. ; Fl. Br. Ind., I., 2jj.<br>Var. debile, Royle, mss.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 544<br>54                  |
| <ul> <li>Vern.—Bassant, dendlu, HIND.; Bassant, dendlu, PB.</li> <li>References*Stewart, Pb. PL, 30, Journ. of a Bot. Tour in Haeara and Khágán, in Yourn. AgriHort. Soc. of India, XIV:, 36-42; Yearbook Pharm., 1874, 623; Atkinson, Him. Dist., 306; Balfour, Cyclop., II., 138; Kew Off. Guide to the Mus. of Ec. Bot., 15.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |

H. 545

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| HYSSOPUS         | The Hyperson                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| officinalis      | The Hyssop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                  | Habitat-A perennial herb, found in the Temperate Western Himalaya<br>from Kumaon, altitude 6,000 to 9,000 feet, to Kashmir, altitude 3,000<br>6,500 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DTE.             | Dye.—The dried herb boiled in alum communicates a yellow or <b>yellow</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 546              | ish-red colour to wool, silk, &c.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br>547 | Ish-red colour to wool, slik, &c.<br>Medicine—The herb is bitter and astringent, and was recom is a dynamic writers as a detersive, resolutive, anthelmintic, diuretic and emmenagogue and externally as excitant, but it does not appear to be use in modern medicine. The authors of the <i>Plwrmacographia</i> ^**^t J^JPL; the following account of the chemical composition of the flowers : *'"?fj the flowers of H. perforatum freed from their calices and dried are exhaustea with absolute alcohol and the tincture is evaporated, a soft residue is let of a red colour (hypericum red) together with volatile oil. If the flowers are exhausted with water, then with dilute alcohol, well dried after exhaustion, and the colouring matter extracted from them by ether, itreraiijs on evaporation as a blood red resin, having an odour of chamomile. I* melts below xoo° and does not yield ammonia by dry distillation. I*'j* insoluble in water and in dilute acids. By aqueous ammonia, potash, and soda, it is coloured green and dissolved; the saturated solution is red by reflected light, but exhibits after dilution a green colour by transmitted light. The ammoniacal solution leaves on evaporation a neutral blood-red resin having the odour of hypericum, soluble with yellow colour in water, and giving off ammonia when treated with potash. The red combines also with the alkaline earths, earths proper, and heavy metallic oxides, its alcoholic solution precipitates the alcoholic solution of chloride of calcium, also neutral acetate of lead, and ferric chloride. It dissolves in alcohol, more readily in ether, with wine-red to blood-red colour, also in volatile oils, and in warm fixed oils ( <i>Buchner</i> ). According to Marquart the colouring matter of the fresh flowers is a mixture of anthocyan and anthoxanthin separable by exhausting with alcohol and treating the residue with water.''                                                                                                                                                                               |
| ¢                | Hypoxis orchioides, Kurz, see Curculigo orchioides, Gczrtn.; Vol.<br>II., 650.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 548              | HYPTIANTHERA, W. 6- A.; Gen. PL, II, 94.<br>Hyptianthera stricta, W.&A.,- Fl. Br. Ind., III., 12i, RUBIACE*.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                  | Syn_RANDIA STRICTA, Roxb.: MACROCNEMUM, STRICTUM, WMd.i<br>Rox Eller A S DCTA, O: HVP <reum jssssu,="" kur»;<br="">RUB CEA, Wal Cat., 81 in part, 8313, 8307.<br/>References.—Roxb., Fl. Ind., Ed. C.B.C., 177; Brandis, For. Fl., 274 3<br/>Kurs, For. Fl. Burm., 11., 50; Gamble, Man. Timb., 229; Indian<br/>Forester, XI., 370; XIV., 343.<br/>Habitat.—An evergreen branched shrub, 3 to 6 feet high, common in<br/>Northern India and Bengal, ascending the outer Himálaya and Khásia<br/>Structure of the Wood — Brown and Burma:</reum>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| TIMBER.          | Structure of the Wood.—Brown, moderately hard, close grained, weight 56lb per cubic foot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 549              | HYSSOPUS, Linn.; Gen. PL, ///., n87.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 550              | Hyssopus ^officinalis, ZJ»«./ Fl. Br. Ind., IV., 649; LABIAT*.<br>Refe<br>in<br>17;<br>Ind., 1st kd 508; S. Arjun, Bomb. Drugs, 100; Year-book of Pharmary,<br>Dic., 218; Treasury of Bot., L., 616;<br>Hyssopus Action of Pharmary, 100; Smith,<br>10, 100; Sind State of |
|                  | H. 550                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| - |                                                                                                                                                                                                                                                                                                                                                                                                               | The Hyssop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ( <b>J</b> . Murray!)                                                                                                                                                                                                                                                                                                                                             | HYSSOPUS<br><u>officinalis</u> .                                |
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|   | to Kumáon. Distribute<br>Medicine.—It appear<br>from Syria and bearing<br>the true Hyssopus officin<br>it did not correspond wi<br>Hebrews. Ainslie also t<br>later years the doubt<br>Hyssop also, though fain<br>not appear to be emplo<br>article of trade with the<br>collected by him near<br>even to give a name for<br>be, it is classed by the<br>a/id deobstruents. The<br>as a tonic and stimulant, | shrub of the Western Him<br>d to Eastern Europe and W<br>rs doubtful whether the plant<br>the above vernacular name is<br>the plants were pro-<br>has been again raised by<br>rhy plentiful in many parts<br>yed locally by the natives<br>plains. Thus Mr. Lace, in<br>Quetta, remarks that the<br>the plant. Whatever the<br>Arabians amongst their an<br>officinal hyssop of Europe<br>, and was at one time in gre<br>liny also thought it useful is<br>thelmintic. | estern Asia.<br>t imported into India<br>is really identical with<br>inion that at any rat<br>s, and the Esof of th<br>bably different, and o<br>Dymock. The tru<br>of the Himålaya, doe<br>, nor does it form a<br>a note on a specime<br>natives do not appea<br>plant Ztjfah yabis ma<br>thelmintics, stimulants<br>has long been know<br>at repute as a remed | A MEDICINE.<br>551<br>e f<br>e s<br>n<br>n<br>r<br>y<br>s,<br>n |
|   |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                   |                                                                 |
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| CHNOCAI<br>frutesce                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                               | ICELAND MOSS.<br>Iceland MOSS, see Cetraria islandica, <i>Achar.j</i> LICHENES; Vol. II., 26<br>ICHNOCARPUS, R. Br.; Gen. PI., II., 717.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                               | Ichnocarpus fragranSi <i>Wall.</i> , see Trachelospermum fragrans,#00&./.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| I                                                                                             | [APOCYNACE^<br>I. frutescens, R- Br.; Fl. Br. Ind., III., 669; Wight, Ic, t. 43<br>Syn.—ECHITES FRUTESCENS, Roxb.; APOCYNUM FRUTESCENS, tinn<br>ICHNOCARPUS RADICANS, Wall.; I. DASYCALYX, Miq. Syama, Roxb.<br>As. Res., I., 261.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                               | <ul> <li>Vern.— Dudhi or siama-latd, HIND.; Dudhi, shydmd or syamalatd, BENC<br/>Dudhi, KOL.; Dudhi lota, SANTAL; Short (Chanda), C. P.; Nali<br/>tiga (of Roxb.), illu katte, nalla Hge, munta gajjanamu (of Ellion<br/>TEL.; Tansapai, BURM.; Kirri-wel, SING.; Sdrivd, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 245; Brandts, For. Fl., 32<br/>Kurz, For. Ft. Burm., II., 185; Dale. &amp; Gibs., Bomb. Fl., 147; Gra<br/>Cat. Bomb. Pl, u3; Sir W. Jone. &amp; V., 95; Sir W. Elliot, Fl.Andh<br/>70, 119, 127, "5; Royle, III. Him. BoU, I., 27r; Wight, Illust., Vol. //<br/>162; Rev. A. Campbell, Econ. Prod., Chutia Nagpur,No. 9220; Phan<br/>Ind., 138; O'Shaughnessy, Beng. Dispens., 54; "• C.Dutt, Mat. Mathind.,<br/>Hind., 195,317, 320; Dymock, Mat. Med. W. Ind., 2nd. Ed., 509; Atka</li> </ul>                                                                                                                                                                                                        |
|                                                                                               | <ul> <li>son, Him Dist. 3i3, 739; Jour. AgrtHort.Soc. Ind. (Old Series), V. 50 • X., 16; Gazetteer, Bombay (Kanara), XV., 438; Gazetteers:-N.~ P., Bundelkhand, 82; of Agra, Ixxiv.; Mysore and Coorg, /., 56. Sett ment RcptChanda, Central Provinces, App. VI.</li> <li>HabitatAn extensive climber, met with on the Western Himálay from Sirmur to Nepal, altitude 1,000 to 2,000 feet; and from the Upp Gangetic plains to Bengal, Assam, Sylhet, Burma, South India, and Ceylor In some of the hotter valleys of the North-West Himálaya, it ascento 4,000 feet, being, for example, frequent below Simla.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                               |
| FIBRE.<br>Bark.<br>2<br>Medicine.<br>Root.<br><b>3</b><br>Stalks.<br><b>4</b><br>Leaves.<br>5 | Fibre.—The BARK yields a good fibre.<br>Medicine.—The ROOT possesses alterative and tonic properties, an<br>is employed as a substitute for Sarsaparilla <i>{Co/if</i> . with Hemidesmus ind<br>cus, p. 219}. The STALKS and LEAVES are used in the form of decoction<br>in fevers. An INFUSION is recommended to be prepared from 2 oz. of th<br>root in a pint of boiling water: of this the dose should be 2 or 3 oz. twi<br>daily. Taylor in his <i>Medical Topography of Dacca {p. 55}</i> says : "Th<br>plant, which derives its name from its creeping stems, abounds with an acr<br>milky juice. The stalks and leaves are used in the form of decoction<br>fever." Dymock <i>{Materia Medica of Western India}</i> discusses this dru<br>conjointly with Hemidesmus indicus. He writes: "They are used togeth<br>and are considered to have similar properties. When, however, <i>sdrivd</i>                                                                                                                                    |
|                                                                                               | used in the singular number, it is the usual practice to interpret it as meaning Ichnocarpus frutescens ( <i>Dutt, Hind. Mat. Med., p.</i> 975). Ichnocarpus frutescens is common in the southern part of the Presidency. The Hi dus consider its roots and those of Hemidesmus to be demulcent, alterati and tonic, and prescribe them in dyspepsia, skin diseases, syphilis, & They are generally combined with bitters and aromatics." The wide ar over which a knowledge of the medicinal properties of this plant occu argues actual merit. Thus from the extreme southern parts of India the north and east, the people use a decoction in the treatment of few In the Journals of the AgriHorticultural Society, for example, repeat mention is made of this property; even the wild N aga tribes, on the nort eastern, frontier of Assam, are familiar with it. The Rev. J. Long ( $A_{i}FC^{-V_{in}}A^{-1} \circ f^{*en}S \ll D$ states that the roots are commonly employ in hospitals under the name of country Sarsaparilla. |

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| The European Holly* (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ILEX<br>dipyrena.                                                                                    |
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| Structure of the Wood.—White, soft, without heartwood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TIMBER.                                                                                              |
| IcthyOCOlla, see Acipenser, Vol. I., 83; also Fish, Vol. III., 369-397;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6                                                                                                    |
| Ignatia amara, and [Isinglass; & Sharks <sup>1</sup> Fins.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                      |
| Ignatius' Bean, see Strychnos Ignatii, Bergius; LOGANIACEJE; Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                      |
| Ilang-ilang, see Cananga odorata, H.f. # T. T.; Vol. II., 93.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                      |
| ILEX, Linn,; Gen. PL, I., 356, 997.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                      |
| Ilex°Aquifolium, Linn.; ILICINER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 7                                                                                                    |
| THE EUROPEAN HOLLY.<br>ReferencesO'Shaughnessy, Beng. Dispens.,271; U.S. "ispens. {Ed-<br>XV), p. 1668; Indian Forester, V., 4*5; XIII., 60, 68; Clarke, Linn-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                      |
| <i>bc. ur., XXV., 11.</i><br>Habitaf—/"small tree, native of Europe; introduced into India and<br>commonly' found in gardens within the temperate tracts. According to<br>Mr. C. B.Clarke, it may also be a native of the Naga Hills on the frontier<br>of Assam, for he collected a holly, not in flower or fruit, but which possessed<br>leaves that matched accurately those of the common holly. The writer<br>found in many parts of Manipur and the Naga Hills, bushy, sterile forms<br>of what he took to be Ilex dipyrena, but possessing very thorny, broad<br>ovate leaves which much resembled in form and texture those of the true<br>holly. Manipur is peculiarly a country of hollies, no less than five species<br>having been -collected, all of which in their higher limits were seen to<br>become flowerless and form stunted bushes with very spinose leaves. Of<br>these five species three are undescribed. The Manipur hollies are: I.<br>dipyrena, <i>Wall;</i> I. Thomsoni, <i>Hook./.;</i> I. sikkimensis, <i>King,mss.j</i> I.<br>Duniana, <i>Watt, mss.;</i> and I. monopyrena, <i>Watt, mss.</i> |                                                                                                      |
| Dye.—The common holly contains the principle <i>litxanthine</i> , a yellow colouring substance soluble in concentrated hydrochloric acid. With alum it dyes yellow and with ferric chloride green.<br>Medicine.—O'Shaughnessy ( <i>Bengal Disp.</i> ) remarks that according to Dr. Rousseau the LEWES and BARK form a useful remedy in intermittent fever; they are also said to be emollient and diuretic. The United States Dispensatory gives an interesting account of this remedy which formerly enjoyed in France a high reputation. Its property was said to depend upon a bitter principle <i>ilicin</i> . A yellow colouring substance called <i>ile-xanthin</i> and a peculiar acid known as <i>Hide acid</i> have been obtained by Dr. F. Moldenhauer. The BERRIES are said to be purgative, emetic and diuretic, 10 or 12 being enough to act on the bowels.<br>Structure of the Wood.—White and hard, much used for ornamental purposes and for calico-printers' blocks.                                                                                                                                         | DTE.<br>8<br>MEDICINE.<br>Leaves.<br>9<br>Bark.<br>10<br>Berries.<br>II<br>TIMBER.<br>12<br>DOMESTIC |
| Domestic—The inner bark affords a viscid substance used as BIRD LIME. The juice is boiled and mixed with a third part of nut-oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DOMESTIC.<br>Bird-lime.<br>13                                                                        |
| <ul> <li>I. dipyrena, Wall.; Fl. Br. Ind., /., 599-<br/>Vem.—Kaula, karaput, muna&amp;i, gulsima, NEPAL; Shangala, kandlar,<br/>kanjru, karelu, dinsa, knicko, kalucho, diusa, dodru, dr&amp;nda, handara,<br/>kadera, kateru (SIMLA), PB.</li> <li>References.—Brandts, For. Fl.o 76; Gamble, Man. Tinib., 82; Stewart,<br/>Pb.Pl.,40; Journal of Bot. Tour, in Hasara by Stewart {AgriHort.<br/>Soc. Jour., XIV., p. 3i); O'Shaughnessy, Beng. Dispens., 272; Indian<br/>Forester, IX., 198; XI., 284; XIII., 60 / Atkinson, Him. Dist., J07 / Kvm<br/>Off. Guide to Bot. Gardens and Arboretum, 145.</li> <li>Habitat.—A small evergreen tree of the Himálaya, from the Indus to<br/>Bhutan and Manipur; found in temperate tracts between 5,000 and<br/>9,000 feet above the sea.</li> </ul>                                                                                                                                                                                                                                                                                                                               | 14                                                                                                   |
| I. 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                      |

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| ILEX                                 | . Paraguay or Mate Tea.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| paraguayen                           | Isis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| FODDER.<br>75<br>TIMBER.             | A remarkable Ilex, which the writer provisionally accepts as a form $ci$ this species, runs to a large wide spreading tree, the leaves being sparingly spinescent. A good example of this exists in Simla, which is peculiar in forming minute yellow seedless fruits in March (as the flowers of next year appear) instead of producing the large orange coloured fruits of Ilex dipyrena which in December constitute a striking feature of the winter vegetation of many parts of the Western Temperate Himalaya. <i>in</i> s may be but the staminate condition of the species, a condition which Darwin ( <i>Origin of Species, p. 73</i> ) describes as observed in I. Aquifolium—the $E^{ur0}$ . pean Holly. But It is worth adding that, in the Simla neighbourhood, an the other examples of I. dipyrena (so far as the writer has observed), with the single exception of the tree here described, are hermaphrodite. $\sqrt{Con} f$ : with <i>Darwin, Forms of Flowers, p. 297</i> , where the English holly is stated to be dioecious or as having only imperfect stamens in the pistilate flowers.) Fodder.—The leaves are occasionally given as fodder for sheep. Structure of the Wood.—White, hard, close-grained. Weight $4^{oTB}$ per cubic foot. Is not much esteemed. |
| 16<br>17<br>TIMBER.<br><b>28</b>     | <b>Ilex Godajam,</b> Colebr.; $Fl_{\sharp}'Br. Ind{t} I., 604.$<br>Structure of the Wood.—Kurz remarks that this species yields a whitish wood, which turns grey, is rather heavy, fibrous and tough, but close-grained.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| IQ<br>TIMBER.                        | I. insignis, Hook././ FL Br. Ind., I., 599.<br>Vern.—Lasuni, NEPAL.<br>Reference.— Gamble, Man. Timb., 83.<br>Habitat.—A small evergreen erect tree, met with in Nepal and Sikkim<br>at an altitude of 7,000 feet.<br>Structure of the Wood.—White, soft, close-grained. Weight 40ft.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TIMBER.<br>20<br>21<br>TIMBER.<br>22 | I. malabarica, Bedd., FL Sylv., t. 143; FL Br. Ind., /., 600.<br>Syn.—ILEX WIGHTIANA, Dale. & Gibs, (not of Wall.)<br>Habitat.—A large tree met with on the Western Ghâts from the Kon-<br>kan southwards, ascending to 3,000 feet in altitude.<br>Structure of the Wood.—Hard, yellowish-white. Mr. Li'sboa {Use-<br>ful PU Bombay, 48) says it is much used for planks, platters, and building                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 23                                   | purposes.<br>I. paraguayensis, St. Hilaire.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| FOOD.<br>24                          | PARAGUAY or MATE TEA; JESUITS' TEA.<br>Habitat.—A native of Brazil and of Paraguay, now extensively cultivated experimentally in most countries.<br>Food.—From time immemorial, the inhabitants of Brazil and Paraguay have been in the habit of drinking a beverage prepared from the leaves of this holly much after the fashion of the use of tea in China. These leaves possess a pleasant aroma and a principle analogous to that in tea and coffee. They have the advantage of cheap and easy preparation, since it has been found unnecessary to cure and roll them by so expensive a process as that adopted with tea. They are scorched and dried while still attached to the branches; then removed by being threshed, ground to a powder and packed in skins or leathern bags. The leaves are collected from the bushes every two or three years from December to August. Although originally and even now to a large extent collected from the wild plant, this holly is also cultivated to afford a more accession the wild plant, this holly is also cultivated to afford a more accession. The wild plant is stated thas 8,000,0008) of leaves were used m South America (the bulk being exported from Paraguay) in place                                                  |

| Paraguay or Mate Tea. (G. Watt.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ) ILEX<br>theaefolia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| of tea, which though gaining ground has by no means displaced the inn<br>genous article. In the Argentine Republic it is stated the consumption<br>amounts to 27,000,000ft per annum, or about 13ft a head, while of col-<br>and, tea only 2lb a head are consumed.<br>The use of <i>mate</i> leaves has been long' known and various attempts has<br>been made to introduce this cheap tea into Europe with little or no pre-<br>tical results. It has even been cultivated in France and other parts of t<br>Continent, but interest is if anything lessening, a result doubtless large<br>due to the cheapening of tea. The first mention apparently (by an Indi<br>writer) of <i>mate</i> is that given by Dr. Ainslie ( <i>Mat. Med., I., 436-437</i> ), the<br>only refers to the substance in an account of tea substitutes. St. Hilai<br>Dr. Ainslie remarks, urges that there is a great difference between t<br>Brazilian and the Paraguayan <i>mate</i> , and he further states that Lamb<br>figures and describes the plant in an appendix to the second volume of<br>1/description of the GENUS Pinus. In the writer's copy of that work the a<br>pendix in question is not given, but there can be no doubt the Paragu<br>Holly was experimentally cultivated in England at the beginning of<br>century. The first plant grown in Isl i a was apparen by is bo bashed<br>the Agri-Horticultural Society of Madras from Kew in the year 1870-<br>may now be seen in most public parks and gardens, and in Lucknow is<br>said to flower and fruit. It is thus probable that the plant could be cu<br>vated in any of the provinces of India, and afford a cheap and wholeso<br>beverage to the millions of people who for generations will most probable<br>be too poor to purchase tea. Various reports have appeared, and an<br>tensive correspondence been conducted, but as yet the cultivation of <i>mu</i><br>in India has not passed beyond the experimental stage, and the plant is oo<br>grown for ornamental purposes. <i>(Con.,</i> with Johnston's Chemistry<br><i>Common Life (Church*s Ed.), pp. 135-140.</i> )<br>The decoction is prepared by pouring boiling water over a small qua-<br>tify of the powder. The infusion is im | di-<br>on<br>fee<br>ve<br>ac-<br>the<br>ely<br>an<br>out<br>re,<br>the<br>ert<br>his<br>ap-<br>lay<br>the<br>by<br>ft<br>t is<br>liti-<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>by<br>ft<br>t is<br>liti-<br>me<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>ett<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>his<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>his<br>his<br>ap-<br>lay<br>the<br>bly<br>of<br>an-<br>the<br>his<br>his<br>his<br>his<br>his<br>his<br>his<br>his<br>his<br>his |
| Ilex theaefolia, Wai?./ 17. Br. Ind., I., 601.<br>Syn.—I. GAULTHERIBFOLIA, KutS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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References.—Kurs, For. Fl. Burnt., I., 245; Gamble, Man. Titnb., 82.

Habitat.—A moderate-sized evergreen tree, found near Darjiling and distributed thence to the Khásia Hills, Manipur, and Tenasserim.

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| ILLICIUM.     | The Star Anise.                                                                                                                                                                  |
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| TIMBER.<br>26 | <b>Structure of</b> the <b>Wood.</b> -White, soft, close-grained, with white concentric lines, which seem to correspond to annual rings. Weight 39ft P <sup>er</sup> cubic foot. |
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| The Japanese Sacred Anise (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ILLICIUM     |
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| One of the earliest notices of the Indian trade in Star Anise occurs in <i>Milburn's Oriental Commerce (Ed. 1813, Vol If., p. 499).</i> The fruits are there said to be the produce of a tree growing in China and the Philippine Islands. The East India Company's sales of imports are given as follows:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | trade.<br>28 |
| 1805 .cwt. 266 valued at £2,947 or £11-1-7 a cwt.<br>1806 . ,, 101 ,, ,, £i>59 $>$ ,, £15-14-10 »<br>1807 . ,, 151 •> »> i*>943 »> 412-17-4 »<br>1808 . ,, 711 ,, » £4 897 >> £ 6-17-9 39                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |
| Mibburn adds that 8 cwt. of aniseeds are allowed to the ton, and that the permanent duty thereon is $\pounds 1-8-6$ , and the temporary or war duty $0*$ for making $\pounds 1-18$ non aut                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |
| <ul> <li>9*. 6rf., making £1-18 per cwt.<br/>The earliest European mention of Star Anise (<i>Pharmacographia, p. 21</i>) is connected with the voyager Candish who brought it from the Philippines about A.D. 1588. Clusius purchased the fruit in London in 1601, and<sup>0</sup>during the seventeenth century it reached England by way of Russia, hence known as <i>Cardamomum Siberiensis</i>. In 1690-92 Kaempfer figured and described the Japanese plant Somo or Skimmi, which, as the learned authors of the <i>Pharmacographia</i> say, was, by subsequent writers, assumed to be the source of the Star Anise. Thunberg was the first to point out that the fruits of the Japanese plant were not so aromatic as those met with in trade. Von Siebold made the same observation and maintained that the Japanese plant was distinct from the Chinese species described by Loureiro. It was left, however, for Dr. Bretschneider to point out that the same time to Mr. Ford (of the Hong Kong Botanic Gardens) to establish the independence of the true Star Anise of South China—to which Sir J. D. Hooker has given the name of I. verum- from Loureiro's Chinese plant and Siebold's Japanese species.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |
| Illicium verum, <i>Hook./.</i> ; MAGNOLIACE*.<br>THE STAR ANISE OF CHINA; BADIANE, ANISETOIL£, <i>Fr.;</i> STER-<br>[NANIS, <i>Germ.</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 29           |
| <ul> <li>I. (anisetum, Linn.) religiosum, S. &amp; L.<br/>THE JAPANESE SACRED ANISE TREE; THE SKIMMI OF JAPAN.<br/>Except as a probable adulterant for the former, the latter (the Japanese)<br/>species is of little interest to India, and even the Japanese themselves use<br/>the Chinese fruit instead of that from their indigenous species.<br/>The true Star Anise of Pakhoi in South China is by the Chinese, known<br/>as Pakionui hiang or eight-horned Fennel, a fact which, as Sir J. D.<br/>Hooker remarks, is due to the fruits, though commonly compared to anise,<br/>resembling more closely in point of test that of fennel.<br/>Vern.—Andsphal, son/, HIND.; Bddidn, BOMB.; Andsphal, DECCAN;<br/>Guz.; Andshuppu (anasi-pu' according to Ainslië), TAM.; Andsapuvu,<br/>TEL.; Nanat-poeh, BURM.; Riziya naje (badiant hut tdie; according to<br/>Ainslie), ARAB.; Bddiydn, raziyanahe-khatdi, PERS.; Bddiydne-khatdi-<br/>TURKEY; Skimoni, somo, JAPANESE.<br/>''* References.— Gamble, Man. Timb., 4; Baillon, Nat. Hist. PL, Vol. I., 146-<br/>151; Hooker, Bot. Mag., July 1888; Bretschneider, China Review, Vol.<br/>IX., 283; Pharm. IndyS; Ainslie, Mat. Ind., II, 19-20; O'Shaugh-<br/>nessy, Beng. Dispens., j, 191; Moodeen Sheriff, Mat. Med. South India<br/>(a forthcoming work), 7; Dymock, Mat. Med. W. Ind., 2nd Ed., 22*<br/>Flück. &amp; Hanb., Pharmacog., 20-22; U. S. Dispens., 15th Ed., 10S, 780°<br/>IGG; Bent. &amp; Trim., Med. PI., w; S. Arjun, Bomb. Drugs, Sibidë<br/>Cat. Raw Pr., Parts Exh., 1, 84, io3; Pharmacog. Ind., 30: Year Book<br/>Pharm.,i873,34,3fl; 1879, 465:'881, 163; 1885, 171; Trvine. Mat.<br/>Med. Patna, 14; Bidie, Report of Madras Drugs shown at the Calcutta<br/>International Exhibition; Baden Powell, Pb. Pr., 326; Birdwood, Bomb.</li> </ul> |              |

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| ILLICIUM<br>verum. | Species of Star Anise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | Pr., 3; Piesse, Perfumery, 02, g3; AgriHort. Soc. Ind. (Trans.), V.,<br>120; Smith, Die, 17,18; Treasury of Bot., Vol. /., 618; Kew Bulletin,<br>1888, 173-17\$; Kew Off. Guide to the Mus. of Ec. Bot., 8; Kew Off. Guide<br>to Bot. Gardens and Arboretum, 78.                                                                                                                                                                                                                                                                                                                                                                                                          |
|                    | Habitat.—The Star Anise tree is a native of Pakhoi, South China.<br>There are, however, three Indian species which may be briefly noticed in<br>this place since they are not of such importance as to necessitate separate<br>and independent accounts.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 31                 | These Indian species are:—<br><b>I. Griffithii</b> , H.f. & T.s Fl. <b>Br. Ind., I.,</b> 40; Griffith, Trans AgriHort.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 32                 | A shrubby species met with in copses in Bhutin and the KhAsia Hills.<br><i>j?jJf<sup>aVe1</sup>.^</i> <b>jPtic-^nceolate</b> , 2 to 4 by 1 to 2 inches in size, acute at both ends.<br><i>flowers</i> is inches in diameter, with a perianth of about 24 leaves, the outer whorl of 6<br>p.1 u ! r. i_T t_f <sup>h</sup> ? <sup>innerof'18</sup> oval petals, the innermost small and narrow: "Car-<br>hafVd'rlitK-1', "Served j terminaldepression well marked. Taste, at firU none.,<br>leaves "(HofmJs)^ ""** acndity > and a flavo « <sup>r</sup> between that of cubebs and bay<br>2. I. majus, H.f. & T.; FL Br. Ind., /40.                                         |
|                    | tudei SSffi <sup>s</sup> $5!5^{\circ}0^{\circ}0^{\circ}Lef^{00t}$ $3^{\circ}$ $\wedge$ $g^{Wh}$ met with in Tenasserim at alti-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                    | Leaves a vate-lanceolate 4 to 9 by 1% t0 2 inches in size, sharply acuminate<br>and petiols nch long. Flowers ? 2%, pedicles 1 to 3 inches long, subterminal<br>tary or fascicled; sepals and petals out 16, out 11, cuiate, inner Droau-uv«u»"«-<br>ments short, broader than the oblong anthers in uituiar, cuiate, inner Droau-uv«u»"«-<br>terminal depression longer and shall 77 » (varies spreading: "Carpels n to 13;<br>the mich The The strongly resembling mace, not bitter" (Holmes).                                                                                                                                                                          |
| 33                 | 3* I- manipulate, Watt tnss.<br>$KJI$ - $\pounds^{I}i^{-ar}P^{tree collected}$ by the writer in the mixed Magnolia and<br>Michelia forests of north and north-east Manipur bordering on the Naga<br>Hills and Upper Burma.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                    | Leaves elliptic, tapering at both ends (almost acuminate) and 3 to 4 by 1 <i>i</i> to 2<br>inches in size; potiole <b>i</b> inch lat """" solitary or fascicled, axillary in the last two<br>or three leaves of the twigs <i>I</i> flower buds bracteate scales five in number, 3 inner ovate<br>obtuse, brown and caducovis, and two longer, narrower, CTMII and nersistent ones at<br>the base of the peduncle; peduncle <i>i</i> to <i>i</i> <b>i</b> inch long; outer perianth-segments 4 broad<br>linear obtuse lemon-green with purple tips, inner 9 to 12 narrow linear ( <i>i</i> inch long<br>and wards                                                          |
|                    | T hold set $S^{h}h^{Spilles}$ u formsaimost loft V t « w and has a stem<br>to to feet S <sup>h</sup> h^{Spilles u formsaimost loft V t « w and has a stem<br>to the branche s occur, and these bear a dense<br>S S S M $I^{h}$ the frontier town between Manipur and the<br>renly has it assigned $I^{y}$ distinct ve name by the savage tribes in                                                                                                                                                                                                                                                                                                                        |
|                    | Naca Hill It is not $1^{2}$ to with between Mainput and the<br>renly has it assigned $1^{y \text{ distinct}} > ve$ name by the savage tribes in<br>whose country it abc $n \wedge In ? ^{05t \text{ of its } c}$ racteristics, especially the                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | whose country it assigned<br>whose country it assigned<br>bracteated pedicles, r wiff <sup>r0aChe</sup> ? T <sup>1051</sup> ^arly to the savage tribes in<br>bracteated pedicles, r wiff <sup>r0aChe</sup> ? T <sup>1051</sup> ^arly to the Sacred Anise of<br>Japan, but the write ''' lie 1 <sup>uestloni</sup> ''g the people around him found no<br>one who attrib_ted t. S' silonous q^lity such as the Japan and. Florida<br>of 7,500 feet near Sf <sup>8688</sup> J <sup>1</sup> twas in flower in February at an altitude<br>Ching Sow, on the Burmese frontier.<br>M.r. P. M. Holmes, K <sup>01</sup> !' A <sup>hom</sup> the description of the fruit of 1 Crif |
|                    | <b>Burness</b> frontier.<br>M.r. 2. <b>M. Holmes</b> , H <sup>01</sup> , A <sup>hom the</sup> description of the fruit of 1. Grif-<br><b>er A nise T ir Wett</b> ^dt <b>T</b> ' <sup>1</sup> , affirms 'that ^e fruit of the japan-<br>immediately and Trow^* 1-i a °£ <sub>L</sub> <sup>a</sup> P <sup>iece of blue</sup> paper reddens it<br>faint red coffitios? fya <sub>L</sub> <sup>A</sup> that CMn «eStar Anise dtuses only a very<br>such reaction.<br>*• Gri»thu and I. majus produce no                                                                                                                                                                        |
|                    | le 33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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| The Star Anise, (G. Watt)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ILLICIUM                           |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | verum                              |
| Oil.—The eight, carpelled fruit of this plant yields by distillation with water an essential OIL somewhat resembling that of aniseed for which it is used in England.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0il.<br><b>34</b>                  |
| The authors of the <i>Pharmacographia</i> remark that "the volatile oil amounts to four or five per cent. Its composition is that of the oils of fennel or anise." It remained fluid at a temperature below 8°C, but soon solidified when a crystal of anethol was brought in contact with the oil. "The crystallized mass began to melt again at i6° C.; the oils of anise and Star Anise possess no striking optical differences, both deviating very little to the left." Eykman ( <i>Phar. Jour. &amp; Trans., XL, 1048</i> ) gives a comparative analysis of the oils of Anise, Fennel, the true Star Anise of China and the Sacred Star Anise of Japan. The differences between the true Star Anise and that of Japan may be here briefl v indicated. The former consists (according to Eykman) chiefly of solid and liquid anethol; its melting point "s QPC; specific gravity 0*978; molecular rotation O° to 0*4°; action of alcoholic hydrochloric acid—colourless; chloral reagent—colourless, then beautifully red; ammoniacal silver solution—after 24 hours no reduction. The latter consists of much of a turpentine, boiling at 173°to 176° C, liquid anethol boiling at 232° to 233° C.; melting point—not solid when cooled to 20° C.; specific gravity 1 "006, molecular rotation—8*6°; action of alcoholic hydrochloric acid—colourless, afterwards blue; chloral reagent—colourless, afterwards dirty brown-yellow; ammoniacal silver solution—reduction in a few hours. In the volatile oil of the leaves Eykman discovered eugenol, shikimen and shikimol— the second a terpine and the last identical with safrol. |                                    |
| The seeds also contain a large quantity of a FIXED OIL. I. religiosum was found by Eykman to contain as much as 30 per cent, of fixed oil. By experiments on dogs he discovered that neither the essential nor the fatty oil represent or contain the poisonous principle. He succeeded, however, isolating a poisonous principle as a crystallizable substance. This he named <i>Sikimine</i> . This analysis has been carried still further by Eykman and the Japanese plant found to contain proto-catechuic acid, shikiminic acid, and shikimipicrin, the last mentioned being the actual poisonous principle. It forms large transparent crystals, freely soluble in water and may be represented by the formula $C_7H_{10}O_3$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                    |
| Medicine.—While the <i>Star Anise</i> has long been employed in China<br>and Japan, but has in India only come into use in modern times. It is<br>chiefly employed in Europe to flavour spirits, the greatest consumption<br>being in Germany, France, and Italy. It is not used as a medicine in<br>Europe, but in India is regarded as stomachic and carminative. It is<br>viewed as of great service in flatulent and spasmodic affections of the<br>intestinal canal. Ainslie remarks that in his time (1826) Europeans in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 35<br>Flavouring<br>Spirits.<br>36 |
| India were not familiar with the drug, but the <i>Vytians</i> consider the FRUITS powerfully stomachic and carminative, and the Muhammadans occasion-<br>ally prepare from them a very fragrant volatile oil.<br>Dr. Dymock mentions that a consignment of a kind of <i>Star Anise</i><br>reached Bombay which was found unsaleable, and chiefly because the fruits<br>were almost devoid of scent. He formed the opinion that they were the<br>produce of I. Griffithii, and apparently because of the fact of their consist-<br>ing of 13 instead of 8 carpels. In a correspondence on this subject Dr.<br>Dymock informed the writer that the consignment in question was first<br>offered for sale at Calcutta, but not finding a purchaser there, was sent on<br>to Bombay. A subsequent enquiry, alluded to under the generic note<br>above, throws considerable doubt, however, on the possibility of the 13-car-<br>pelled consignment in question having been the fruits of I. Griffithii.<br>The <i>Flora of British India</i> does not mention the number of carpels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |

I. 37

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| <b>IMPATIENS</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| Balsamina.               | The Garden Balsam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MEDICINE.<br>FOOD.<br>38 | possessed by the two hitherto published Indian species, but, I. imphalense<br>has 8 to 12, and according to Holmes, I. Griffithii has 13, and I. majus 11. to<br>13- It is, as suggested above, much more likely, therefore, that the ip-<br>odorous form described by Dymock is a foreign imported fruit, most proD-<br>ably from the Straits or Cochin China. I. verum and I. religiosum have<br>only 8 carpels and the two American species have also that number; *:<br>floridanum like I. religiosum are poisonous, at least so it is stated of the plant<br>found in Alabama. I. parviflorum, the Georgian species, has a flavour<br>closely resembling that of Sassafras root.<br>SPECIAL OPINIONS.—§ "Extensively prescribed by Hakims as car? <sup>11</sup> ;<br>native and stomachic. Seldom, if ever, prescribed by Kobirajs" (C.*w<br>Surgeon S. M. Shircore, Moor she dab ad). "After roasting and mixing<br>with equal parts of sugar is thought to be useful in ordinary dysentery.<br>My personal experience is limited" (Surgeon-Major C.J. McKenmh<br>/. M, D.y Cawnpore).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                          | IMPATIENS,Linn.; Gen. PL, /., 277, 989.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                          | A genus of succulent herbs, rarely shrubs, comprising in all some $150$ <sup>5</sup> P®iff <sup>es*</sup> chiefly distributed throughout the mountains of Tropical Asia and Africa. They become rare in Temperate Europe, North America, and South Africa, though in India some of the most prevalent species are those met with on the Temper-<br>ate Himálaya, the under vegetation of the mixed forests of the Western divi-<br>sion often consisting almost exclusively of a rampant annual growth of one <i>or</i><br>perhaps two or three species of Balsam. Indeed, India alone possesses 123 of the<br>known species, and of these the vast maiority occur on the Western Ghats the<br>mountains extending from Bombay and Madras to Ceylon. Some of thesespecies<br>are distributed throughout the area indicated, but Madras possesses 40, Bombay<br>35» and Ceylon 211; while the lower mountains of Bengal, the Central Provinces,<br>the North West Provinces and the Panjab each have only one or at most two<br>species and these are common also to all the other provinces of India. In Assam<br>(chiefly on the Khasia Hills) there are 23 species and 9 in Burma. The Burn<br>mess species may be described as the most implical Indian members of the<br>Equation of the last being also found in the Khasia Hills. Many of the<br>Western Himilayan species extend from Kumaion to Kashmir, a few only going<br>eastward to Sikkim. These Western forms are also by far the most prevalent,<br>and, as already remarked, miles of country during the monsoons (June to Sep-<br>tember) are literally covered with one or two species. This is peculiarly the<br>case near Simla where I. <b>amphorata</b> a magenta coloured one, dispute pos-<br>session with the yellow-flowered I. <b>scabrida. It</b> is significant also that with<br>the exception of I. Balsamina all the West Himalaya species belong to the<br>section with linear capsules, and most of them possess in addition edible seeds. |
| 39                       | <ul> <li>Impatiens Balsamina, Linn.; Fl. Br. Ind., /., 453; GKRANIACE2E.<br/>THE GARDEN BALSAM.</li> <li>Vern.—Gál-mendi, HIND.; Dápati, BENG.; Haragaura, URIVA; Hujethi,<br/>(a name indicative of its yielding a red dye), NW. P.; Bantil, tráai,<br/>hálá, tatúra, pah i, tildhér, ják, PB.; Teradá, BONB.; Tiradá, MAR.;<br/>Panshit, dan-let, BURM:<br/>References.—Roxb., Fl. Ind., Ed. C.B.C., 219; Voirt, Hort. Sub. Cal.,<br/>189; Thwaites, En. Ceylon Pl., 65; Dals. &amp; Gibs., Bomb. Fl., 44;<br/>Stewart, Pb. Pl., 36; Mason's Burma &amp; Its People, 433, 765; U.S. Dis-<br/>pens., 15th Ed., 1660; Atkinson, Him. Dist., 774; Gasetteers:—Orissa,<br/>11., 178; App. VI.; Mysare &amp; Coorg, I., 69; Bombay (Ranara), XV., 439;<br/>NW. Provinces, Bundelkhand, 79; Himalayan Districts, 307; Indian<br/>Forester, IX., 292; XII., App. 8.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

I. 39

| The Garden Balsam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (G. W                                                                                                                                                                                                                                                                                                                                                               | (att.)                                                                                                                                                                                                                                                                                                                                                                                               | MPATIENS              |
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| Habitat.—A native of India, introduced into England<br>which date its cultivation has been prosecuted with mu<br>ornamental exotic. In the North-West Himálaya it ofter<br>tifully in fields, at about 3,000 feet above the sea, as to give<br>purple tint. The cultivated plant may be said to have be<br>m the vicinity of gardens, in the plains of India, but the<br>only on the lower hills, and is not met with on the plains p<br>The <i>-Flora of British India</i> describes six varieties,<br>(2) coccinea, (3) arcuata, (4) macrantha, (5) micrantha<br>The last mentioned is the form met with in the Western<br>Nos. 3, 4, and 5 are found in the Western Peninsula.<br>Firminger says the best time to sow Balsams, in the<br>is September, and that the plants should be retained in p<br>ready *6 be planted out in the border. If sown earlier<br>destroy them, and if later they do not obtain sufficient<br>their flowering properly.<br>Dye.—Madden says that the flowers of this plant are<br>for a dye, whence it is called <i>Majiti</i> or <i>Mujethi</i> . The<br>from the Jhaintiya hills a few samples of plants used by th<br>dyeing. Among these was found a specimen of this I<br>remark "Leaves when bruised together with <i>Metchta</i><br>colour." The writer cannot discover a detailed account<br>of this plant, and is therefore unable to offer any opinion<br>of the red dye it contains That it does possess a colour<br>one closely allied to madder in appearance, there <i>seems</i><br>The subject is well worthy of careful examination, since<br>cultivated plant (to be found in Europe) is likely enough<br>property. A use for the wild plant would be a positive bo<br>laya cultivators whose crops are often seriously injured by<br>The flowers of the British I. Noli-me-tangere were of<br>employed as a yellow dye. Baillon <i>{Natural History o</i><br>remarks of Impatiens : "Several Balsams are tinctorial p<br>I. fluva, <i>Nutt</i> , and I. tinctoria, <i>A. Rich</i> . The Tartars a<br>their eyes and nails with the juice of several balsams with | ich succ<br>n occurs<br>the fiel<br>ecome na<br>wild for<br>proper.<br>vis., (1)<br>h, and (<br>Himála<br>plains o<br>pots unti<br>the sev<br>heat to<br>in Garl<br>e writer<br>he inhat<br>balsam,<br><i>langa</i> §<br>of the<br>n as to t<br>ring prin<br>to be r<br>it is pro-<br>n to pre-<br>pon to th<br>y the we<br>nce upr<br><i>f Plants</i> ,<br>or said | 596, since<br>cess as an<br>so plen-<br>ds a rose-<br>aturalised<br>rm occurs<br>vulgaris,<br>6) rosea.<br>aya, while<br>f Bengal,<br>1 they are<br>vere rains<br>allow of<br>wal used<br>received<br>bitants for<br>with the<br>give a red<br>chemistry<br>he nature<br>aciple and<br>to doubt.<br>bable the<br>serve this<br>he Hima-<br>red.<br>'n a time<br>, V., JJ)<br>especially<br>to colour |                       |
| Oil & Food.—The seeds are eaten in Chumba, and is eaten and also humad                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | the oil e                                                                                                                                                                                                                                                                                                                                                           | expressed                                                                                                                                                                                                                                                                                                                                                                                            | OIL ft FOOD.          |
| is eaten and also burned.<br>Medicine.—It is not known whether any of the Indian<br>tiens have attributed to them medicinal properties; I. Noli<br>an acrid burning taste, and when taken internally, act<br>cathartic, and diuretic. It is considered too dangerous, h<br>much use. The United States Dispensatory, after havin<br>cussed the properties of I. fulva, I. pallida, and I. Noli-m<br>that I Balsamina resembles the other species in its effect<br>of I. Noli-me-tangere that it was formerly valued as a di<br>hemorrhoidal. It was topically used for pains in the join<br>to cure diabetes, but it is not much thought of at presen<br>cornut is said to make the hair grow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | i-me-tar<br>ts as ar<br>owever,<br>g previo<br>e-tanger<br>ts Bai<br>iuretic a<br>ts and                                                                                                                                                                                                                                                                            | ngere has<br>n emetic,<br>to be of<br>ously dis-<br>re, states<br>llon says<br>and anti-<br>was said                                                                                                                                                                                                                                                                                                 | 41<br>MEDICINE.<br>42 |
| Impatiens racemosa, <i>DC</i> ; <i>FL Br. Ind.</i> , /., 479.<br>Habitat.—A small, herbaceous plant (2 to 3 feet high)<br>temperate Himálaya, altitude 5,000 to 7,000 feet from Sim<br>times ascending in Sikkim to 12,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                      | 43                    |
| Dye.—Specimens in the herbarium stain the paper of<br>mounted as well as any plants they come in contact with<br>pink resembling madder. <i>{Conf</i> with I. Balsamina.) Th<br>first pointed out by Edge worth, but the writer has found                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | of a bri<br>lis prop                                                                                                                                                                                                                                                                                                                                                | ight rose<br>erty was                                                                                                                                                                                                                                                                                                                                                                                | dye.<br>44            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                     | I· 44                                                                                                                                                                                                                                                                                                                                                                                                |                       |

| IMPERATA                       | A The Ulu Grass.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| arundinace                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| OIL.<br>Seeds.                 | with his own specimens, the dye being specially washed out with the spirit<br>and corrósive sublimate employed in poisoning.<br>Oil.—The SEEDS yield oil which is used for burning; it is also edible.<br>Impatiens Roylei, Walp.; FL Br. Ind, I., 468.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 46                             | Habitat.—A handsome bush, often 10 feet in height, common on the temperate Western Himdlaya from Nepal to Marri, altitude 6,000 to 8,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| OIL &<br>FOOD.<br>Seeds.<br>47 | Oil & Food.—The raw SEEDS are edible, tasting like nuts; from them<br>an oil is prepared which is both eaten and used for lamps.<br>I. Sulcata, Wall.; FL Br. Ind., I., 469, 473.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 47<br>48                       | Habitat.—A gigantic annual, often 15 feet in height, frequent on me<br>temperate Himálaya, altitude 7,000 to 12,000 feet. The writer came into<br>an expanse of grassy hills in Kullu where these plants formed an almost<br>impenetrable mass. On endeavouring to push his way through it, the <sup>se</sup> ?** <sup>s</sup><br>shot off in every direction in such showers that it was almost impossible<br>to open the eyes. He was guided to the spot by a native who assured<br>him that pigeons in great numbers would be found. This proved the case,<br>the birds rising in great flocks from the balsam upon which they were feed-<br>ing. At another place he found the people collecting the seeds, and was<br>told they were to extract oil from them.                                                                                            |
| OIL &<br>FOOD.<br>Seeds.       | Oil & Food.—The SEEDS are edible and yield an oil. Dr. Aitchispn<br>says that in Lahoul the HUSKS are also eaten raw.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>49</b><br>Husks.            | IMPERATA, Cyr./ Gen. PL, III., ü25.<br>[Gramines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 50<br>51                       | <ul> <li>Imperata arundinacea, CyrilL; Duthie, Fodder Grasses, N. Ind. y 23;</li> <li>Syn.—SACCHARUM CYLINDRICUM, Linn.; LAGURUS CYLINDRICUS, Linn.;<br/>IMPERATA CYLINDRICA, Beauv.; I. KCENIGII, Beauv.</li> <li>Vern.— Usirk, sir, sil, bharwai, UPPER IND.; Ddbh, HIND.; UM, BENG.#<br/>Shiro (Bhabarand Lower Hills), NW. P.; Siru, Alii, PB.; Dab, SIMLA 5<br/>Tharpai-pullu, TAM.; Ba<sub>u</sub>umbiss (according to Roxburgh), modava<br/>gaddi (according to Elliot), TEL.; Tkek-kay-nyen, BURM.; Iluk,SIUG &gt;<br/>Darbha (according to Dutt) (balbajamu, barhissu, (according toElliot)i<br/>SANS.</li> </ul>                                                                                                                                                                                                                                     |
|                                | References.—Roxb., Fl. Ind., Ed. C.B.C., 78; Voigt, Hort. Sub. Cal., 7<>4?<br>Thwaites, En. Ceylon Pl., 369; Stewart, Pb. PL, 257 / Aitchison, Cat'<br>Ph. and Sind Pl., iy3; Mason, Burma and its People, 524, 817; Elliot,<br>Flora Andkr., 20, 23, 116; Kurz, Prelim. Rept. Pegu; U. C. Dutt, Mat<br>Med. Hind., 296; Bidie, Cat. Raw />., Paris Exh., 76; Atkinson, Him<br>Dist., 321, 808; Jour. AgriHort. Soc. Ind., X., 3S7; XIII., 337; (New<br>Series), I. (ProcJ, 62; II., 300; Indian Forester, /., 22; IV., 168 / IX.,<br>245; X., 26.                                                                                                                                                                                                                                                                                                             |
| FIBRE.<br>52                   | Habitat,— A small perennial grass inhabiting the plains and hills of<br>Bengal, the North-West Provinces, the Panjab and Sind, in moist, stiff<br>pasture ground It is particularly common over Bengal, and ascends the<br>Himalaya to altitudes of 7,500 feet. When in flower about April and<br>May, the fields, roadsides, and railway embankments become white with<br>its silky heads. It is, in fact, a very characteristic grass of the neighbour-<br>hood of Calcutta, the <i>maidan</i> being chiefly carpetted with it.<br>Fibre.—Used for the same purpose as that obtained from the <i>Munja</i><br>(Saccharum ciliare, <i>Anders.</i> ), namely, to prepare the sacrificial thread of<br>the Hindus; and the leaves are employed for thatching ( <i>Atkinson's Hima-<br/>layan Districts</i> ). Roxburgh says that the Telingas make use of it in |
|                                | their marriage ceremonies. He adds that it is much used in Bengal for<br>thatch, and Mason remarks that this is the case in Burma also. Thwaite<br>states that in Ceylon this grass is viewed as making excellent thatch.<br>I. 52                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

(G. Wait.) **INDIA-RUBBER.** Incense; Caoutchouc. FODDER. Fodder.—Not of much use as a fodder, because cattle refuse it except when quite young, or when no other forage can be obtained. M£. Duthie 53 writes: " In Australia it is called ' blady-grass/ and the young succulent foliage which springs up after the occurrence of a fire is much relished by stock. I have observed the same effect resulting from periodical fires on certain parts of the Himálaya where this grass is plentiful.' Implements and Machinery, &C, Woods used for. See Agricultural Implements, Vol. I., 145. 54 >ncense, an odoriferous preparation burned at religious ceremonies. Frankincense (= pure incense) may be regarded as the chief and more expensive ingredient (see Boswellia, Vol /., pp. 511 to 514), the following being the materials of incense used by the poor or employed as adulterants with Olibantfm :-(1) Boswellia serrata, Roxb. Gugul or Salhi gum, the Indian Olibanum. (2) Cupressus torulosa, Don. (3) Juniperus communis, *Linn*. The smoke of the green roots was considered by the ancients to be most acceptable to the infernal gods. (4) J. macropoda, Boiss (? J. excelsa, Rieb.). (5) J« recurva, Ham. (6) Jurinea macrophylla, *Benth*. The roots of this herbaceous plant are largely collected in Kumáon and Garhwal under the name of Dhúp, and either exported to the plains or made into a resinous preparation which in that condition is exported, (7) Morina Coulteriana, *Royle*. (8) Pinus longifolia, Roxb. Known in Oudh as Dhúp. (9) Saussurea Lappa, Clarke. The sacred Costus root largely exported from Kashmir and used in the preparation of perfumery, medicine, and expensive forms of incense. (zo) Taxus baccata, *Linn*. Though mentioned by writers on this subject as ingredients in incense, it is not known to what extent the coniferous plants in the above list are used in the incense burned at Hindu temples. After Olibanum, Nos. 1, 6, and 9 are the most important and in that order relatively. ndian Fig or Prickly Pear, see Opuntia, Vol. V. ndian Red, see Pigments, Vol. V. ndiatl Shot, see Canna indica, Vol. II., p. 102. INDIA-RUBBER, CAOUTCHOUC or GUM ELASTIC. GOMME ELASTIQUE, CAOUTCHOUC, Fr.; KAUTSCHUK, Germ. \$ VERDERHARS, Dutch; COMMA ELASTIC, //. & Port.; GOMA ELASTIC, Sp., • GUMMI, Da. & Sw. ; CHIRIT MURAI, Malay.; SIANG-PI, Chin. **DESCRIP-**TION. 55 **Caoutchouc or India-rubber** is the inspissated milk or sap obtained from at least six genera of plants which belong- to three widely different Natural Orders, vie., Landolphia and Willoughbeia, to APOCY-NACEJE ; Castilloa and Ficus, to URTICACEJE (sub-order ARTOCARPEJE); and Hevea and Manihot, to EUPHORBIACEJE In the plant tissue Caoutchouc is found to circulate within certain anastomosing vessels which are distributed throughout the middle or more rarely the inner layer of bark. A far larger number of plants possess a milky sap (and even a caoutchoucvielding sap) than those generally viewed as the sources of India-rubber. The term Caoutchouc is sometimes used synonymously with that of Indiarubber, but it is more correctly the pure hydrocarbon isolated from the

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DESCRIP-TION. Chemical and Physical Peculiarities of

other materials with which it forms the impure rubber of commerce. Under the microscope the milk appears as a kind of emulsion with minute globules, the caoutchouc granules suspended in it. These range from **20^000** to **¥050**. Of an incn in diameter. Caoutchouc is highly elastic, lighter than water, has neither taste nor smell, is fusible at about 120°C (248° Fh.) and inflammable at higher temperatures. According to Faraday it consists of 87-2 parts of carbon and 12 8 of hydrogen. The sample he examined came from India, and was thus probably obtained from Ficus elastica. It is interesting to add, therefore, that Faraday makes no mention of having detected ammonia in the rubber he examined.

When the bark of plants containing this substance is cut, the milk exudes, and in time hardens on exposure to the air. This agglutination may be hastened by adding salt water or alum to the milk, but the former increases one of the defects of rubber, vis., its hygroscopic property, and thus injures it commercially. It would seem that the chemist has still to perform a service to the planter and extractor of rubber that is likely to prove of the greatest importance, *viz.*, to analyse the fresh milk of each and all the rubber-yielding plants. The methods of coagulation in practice are very much the hereditary arts of savages, instead of being based, as they should, be, on scientific principles. It does not follow that the acid process, though applicable to one milk, is at all suited to another; in fact, systems of extraction have been brought about by experience blindfoldly instead of based on demonstrated science, hence the full amount of rubber contained in the milk is not, as a rule, removed. It is commonly stated that the best rubber is obtained by boiling the milk, but delay in agglutination is reported to be injurious, since destructive oxidation takes place. Where the climate of the rubber forests is detrimental to human life, the collectors frequently add alum to the fresh milk, as a temporary measure, and  $ence \pounds$ the complete separation of the rubber with greater deliberation on reaching their homes at some distance from the forests. It is believed by most writers that the milk is kept in its fluid state within the plant tissue through the agency of ammonia—a theory in part supported by the facts that the fresh milk has often an ammoniacal odour, and that a little ammonia \* added to the milk has been observed to facilitate its retention in the liquid state. On coagulation, the milk changes colour, assuming a more or less reddish tint, and forming a plastic leathery substance. A thin piece is seen under the microscope to contain irregular rounded pores which partially communicate with each other and dilate under the influence of fluids.

Chemically India-rubber may be said to approximately consist of two substances—an elastic material, on which its merit depends, and a viscid, resinous, readily oxidisable principle, to which it owes its depreciation. The greater the amount of resin present in a sample of rubber, the less is its value, but it is remarkable that the amount of this oxidisable substance seems to be more consequent on a tardy precipitation of the caoutchouc from the milk, than on individual or even specific differences in the plants from which it is obtained. The property of the elastic substance also varies, and in a marked degree, between that obtained from one genus of plants and another, for every gradation exists between the non-elastic hydrocarbon known as Gutta-percha and the finer qualities of Gum Elastic, such as the Para and Ceara rubbers which contain the smallest known amount of resinous matter. The African and Guatemala rubbers possess the highest percentage, and are consequently the least valuable.

Caoutchouc is quite insoluble in water, alcohol, and acids. It is, how-

<sup>•</sup> *Con/*, with remarks at page 360.

Caoutchouc or Gum-elastic. (G. Wait.) INDIA-RUBBER.

ever, oxidised by strong nitric and charred by strong sulphuric acid. SOLVENTS for Ether, benzone, rock-oil, and sulphide of carbon penetrate it rapidly, causing CAOUTCHOUC it to swell up and ultimately assume an apparent though not actual con-"The liquid thus formed is not, however, a complete dition of solution. solution, but a mixture formed by the interposition of the dissolved portion between the pores of the insoluble substance, which is considerably swelled up, and has thus become easy to disintegrate. By employing a sufficient quantity of these solvents, renewed from time to time, without agitation, so as not to break the tumefied portion, the caoutchouc may be completely separated into two parts, *viz.*, a substance perfectly soluble, ductile, and adhering strongly to the surface of bodies to which it is applied; and another substance, elastic, tenacious, and sparingly soluble. The proportions of these two principles vary with the quantity of the caoutchouc and the na'ure of the solvent employed. Anhydrous ether extracts from the amber-coloured caoutchouc 66 per cent, of white soluble matter; oil of turpentine separates from common caoutchouc 49 per cent, of soluble matter having a yellow colour. The best solvent for caoutchouc is a mixture of 6 to 8 pts. of absolute alcohol and 100 pts. of sulphide of car-•\* Caoutchouc yields by dry distillation an empyreumatic oil called bon." OIL OF CAOUTCHOUC or CAOUTCHOUCIN, which forms an excellent solvent for caoutchouc and other resins. It is a mixture of a considerable num-ber of hydrocarbons. Ordinary impure caoutchouc likewise yields small quantities of carbon anhydride, carbonic oxide, water and ammonia " (Watts' Chemistry).

Continued boiling in fixed oils also causes the separation of the caoutchouc particles thus seemingly to dissolve the rubber. Of this nature doubtless is the action of *garjan* oil, the property of which, as a solvent for caoutchouc, the writer has already alluded to under Dipterocarpus turbinatus *(Vol. III., 165),* Mr. Laidlay in 1839 reported that when frag-ments of rubber are dropped into *garjan* oil (especially if the oil be heated or boiled) the rubber swells and dissolves. Since the date on which this republication was made of Mr. Laid lay's discovery, the writer has come across another passage which would seem to refer to the solvent property across another passage which would seem to refer to the solvent property of garjan oil, and he has also performed certain preliminary experiments to test the accuracy of the reports regarding *garjan* oil as a solvent. Mr. **Strettell, in his** Narrative or my Journey in Search of Fiws e last tea in Burma Proper, states (p. 184) that a Mr. Henri who was employed by the King to work the serpentine mines bethought him of a method of repairing the gutta-percha tubing that had got out of order. Observing water-proof baskets used by the people for baling water he enquired as to the material used in rendering these waterproof. He found it to be the India-rubber of Ficus elastica. Further on, Mr. Strettell, commenting on Mr. Henri's discovery, remarks: " I had endeavoured to find out the process adopted by Mr. Henri to utilize caoutchouc in the form of a cement for repairing the gutta-percha tubing of his pumps, but no reliable information could be obtained. One account was that he boiled ten *ticknls* of caoutchouc with two-and-a-half *tickals* of *hunnin* oil, but this is impossible." The writer's elemcYitary experiments, suggested on reading Mr. Laid lay's report, have satisfied him that far from being impossible it is probable that the above re-port was correct, and he strongly suspects that the Burmans use more extensively than we have any positive knowledge of, a solution of caoutchouc dissolved in In or Kanyin oils. Procuring in the Simla bazar a bottle of the substance sold as garjan oil, the writer performed Mr. Laidlay's experiments, but was more successful in dissolving gutta-percha than India-rubber. It was thought, however, desirable to obtain from Burma well authenticated samples of the various forms of wood oil; accordingly Mr. J. W.

22 A

INDIA-RUBBER.

DESCRIP-TION. Industrial Uses of Gutta-Percha.

Oliver, Conservator of Forests, Upper Burma, was addressed on this subject, and that officer very obligingly furnished samples. Messrs. **Stade**, fitToussaint kindly collected these samples at Mr. Oliver's request, but unfortunately the jar containing *In* oil got broken on its way to Simla, so that the experiments could be tried only with the various forms of *Kanytp*<sup>A</sup> oils. These oils after prolonged boiling all acted as solvents both of India, rubber and Gutta-percha, and it was observed that the pure oils decantea from the resin possessed this property to a less extent than when used in the impure form—resin and oil mixed.

Thinking that perhaps a solution of rubber in *Kanyin* oil might be **used** in the water-proofing of Burmese umbrellas, the writer also invited Oliver to investigate that subject, remarking that it was customary to i ead of umbrella water-proofing as accomplished by a decoction preparea from the fruits of a Diospyros. Mr. H. Jackson, Deputy Conservator of Forests, Prome, furnished the report and samples which this enquiry elicited. Two bottles were received, one containing a strongly adhesive balsamic substance, said to have been prepared from the fresh fruits oi Diospyros burmanica, and the other a varnish made from earth-oil, rosin, wax\* and vegetable oil. There is thus no India-rubber used in the Burmese umbrella water-proofing, and the process and manipulation pursued by the Burmese appears to differ from that followed by the Chinese mainly in that the latter people use the fruits of Diospyros pyrrhocarpa (Conf. with Vol. III., 154). Whether or not the above facts regarding the solvent property of the Dipterocarpus oils on caoutchouc may prove of industrial value, they are of interest in amplifying what has been said under Dipterocarpus and Diospyros. It may, therefore, be added that the writer observed that hot garjan oi<sup>1</sup> painted on cloth previously dyed with cutcW, and mordanted with alum, dried in a few hours. This latter fact may be of considerable utility, since (as remarked under Dipterocarpus) the chief drawback to the utilisation oi gar jan oil has hitherto consisted in the difficulty of drying the oil. A cloth painted with cold or hot gar jan oil took some months to dry and when dry became stiff, so that on being folded it cracked and gave out the resinous principle of the oil. The cutch-dyed cloth, on the other hand, dried in a few hours and never became stiff nor parted with its resin. It was, however, not completely water-proof, and the gar jan oil seemed to soften when water was left on the cloth for some hours.

The reader should consult the article Gutta-percha {Vol. III., 101*iog*). A comparison of the list of plants there given, as yielding that substance with those that afford rubber, will reveal the fact that the majority of the former belong to the Natural Order SAPOTACE; E, while the latter are mainly obtained from members of the URTICACE^K and EUPHORBIACE/E. The APOCYNACEJE and ASCLEPIADACE^ appear sometimes to yield guttas, at other limes rubbers. The exact nature of the hydrocarbons obtained from these families, however, must remain undetermined until they have been subjected to a careful chemical examination. The allotment given in this work of certain species as yielding gutta and of others rubber, may there-fore have to be adjusted hereafter. Mr. W. T. Thiselton Dyer read *a*. paper on this subject before the Linnean Society [Proceedings, June 1882, p. 35] in which he discussed the Apocynaceous India-rubber plants of the Malaya and of Tropical Africa. He pointed to the interesting fact that these all belong to the TRIBE CARISSEJE. Mr. J. Q. Baker, in an article which appeared in the *Gardener's Chronicle (1886)*, dealt with the sources of the India-rubber of commerce. "Part of the supply," he wrote, " comes from South America (shipped principally from Para and Carthagena), part of it from Sierra Leone, Mozambique, and Madagascar, and the remainder from tropical Asia." .Besides the two genera of APOCYNACEJE (Landol-

|                                                                                                                                                                                                                                                                                                                       | Genera of Plants yie                                                                                                                                                                                                                                                                                                       | lding                                                                                                                                                    | Rubber. (G. Watt) I                                                                                                                                                                                                                                                                                                                                                                                            | NDIA-RUBBEI                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| a similar mill<br>In the United<br>ploying 15,00<br>States in that<br>value of the<br>\$50,000\$\[0] 18<br>K g f t had<br>India-mbber]<br>the time will<br>will gradually<br><sup>i</sup> eldir.g gene<br>them which of<br>grow them.<br>of all kinds<br>only about 2<br>African and<br>nishes a most<br>their native | 8? wu more than 10,00<br>sunk S 1~ than £2,0<br>have yet been brought<br>soon come when either<br>lessen. There are about<br>ra, and the botanists and<br>f these are best worth<br>Unfortunately, at the p<br>is exceptionally low, the<br>5. orf. per pound in Lon<br>Asiatic kinds about 2s<br>instructive table of the | rere 12<br>nporta<br>orth a<br>00,000<br>into c<br>fhis v<br>ut sixt<br>cultiva<br>cultiva<br>present<br>ne best<br>ndon a<br>s. per<br>India<br>rts int | imate<br>ibber imported into the Un<br>worth about ^3-OocjW<br>N $\gg$ ^ *e W W $^{\circ}$ y<br>ultivation on a large<br>vill have t o ^ or the su<br>y distinct species of the rul<br>s ers will have to settle bet<br>ating and where it will p<br>of India-rul<br>t time, the price<br>Para rubber being now y<br>gainst*;, in 1884, and the<br>pound.'' Mr. Baker the<br>rubber-yielding P <sup>1ant</sup> | em-<br>o the<br>The<br>ed at<br>nited<br>, but<br>*ld<br>and<br>upply<br>bber-<br>ween<br>ay to<br>ubber<br>worth<br>e best |
| Natural Order.                                                                                                                                                                                                                                                                                                        | Genus.                                                                                                                                                                                                                                                                                                                     | Number of<br>species.                                                                                                                                    | Native country.                                                                                                                                                                                                                                                                                                                                                                                                | Imports<br>in Tons.                                                                                                         |
|                                                                                                                                                                                                                                                                                                                       | · <b> </b> ····                                                                                                                                                                                                                                                                                                            |                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                             |
| Apocynacese •                                                                                                                                                                                                                                                                                                         | WiUoughbeia . % «<br>Landolphia (including                                                                                                                                                                                                                                                                                 | <b>9</b><br>16                                                                                                                                           | Tropical Asia . • •<br>Ainca and Madagascar , •                                                                                                                                                                                                                                                                                                                                                                | 2,200                                                                                                                       |
| Apocynacese .                                                                                                                                                                                                                                                                                                         | Landolphia (including<br>Vahea).<br>Hancornia • • •<br>Urceola • • •                                                                                                                                                                                                                                                       | 16<br>1<br>7                                                                                                                                             | Ainca and Madagascar , •<br>Brazil.<br>Malay Peninsula and Archi-<br>pelago.                                                                                                                                                                                                                                                                                                                                   | 2,200                                                                                                                       |
| 22<br>22<br>23<br>23<br>23<br>23<br>29<br>29                                                                                                                                                                                                                                                                          | Landolphia (including<br>Vahea).<br>Hancornia • •<br>Urceola • •<br>Couma (Collophora)<br>Alstonia^ •<br>Cameraria                                                                                                                                                                                                         | 16<br>1<br>7<br>3<br>4<br>3<br>2                                                                                                                         | Ainca and Madagascar , •<br>Brazil.<br>Malay Peninsula and Archi-                                                                                                                                                                                                                                                                                                                                              | 2,200                                                                                                                       |
| 23                                                                                                                                                                                                                                                                                                                    | Landolphia (including<br>Vahea).<br>Hancornia • •<br>Urceola • •<br>Couma (Collophora)<br>Alstonia^ •                                                                                                                                                                                                                      | 16<br>1<br>7<br>3<br>4<br>3                                                                                                                              | Ainca and Madagascar , .<br>Brazil.<br>Malay Peninsula and Archi-<br>pelago.<br>Malay Peninsula.<br>Guiana and Brazil.<br>Malay and Fiji.<br>West Indies.                                                                                                                                                                                                                                                      |                                                                                                                             |

The facts in the above tabulated statement, and the arguments used by Mr. Baker regarding the present immense trade and future possible décU,(e in supply, should cultivation be not resorted to, have been urged by rn^nTwritersand have proved the keynote to the extensive experiments inducted in India and other tropical countries. An attempt will be made, in the subsequent pages, to discuss very briefly the nature of these experiments, but in concluding the present introductory remarks it may safely be said that the Assam plantations of Ficus elastica represent the most rational efforts that have been made, though high expectations are also entertained of the Tenasserim Hevea (Para) plantations. So long ago as 1880 Dr. King, while reporting the successful introduction of the climbing Landolphia rubber plants into the Botanic Gardens, Calcutta, remarked : **INDIA-RUBBER.** 

**DESCRIP-**TION.

CAOUT-

50

CHOUC PLANTS. Indigenous Caoutchouc-vielding Plants.

w But I fear, even if it were to turn out to be suited to the climate of Calcutta, Landolphia would prove rather an unmanageable crop ; for it is described to be an enormous creeper, climbing to the tops of the highest trees. With regard to all these exotic rubbers, it must be remembered that' with the exception of Ceara' they are either very large trees or climbers; ana although it may pay well to collect rubber from them in their native forests, where they have grown to maturity without cost to ths collector, it is quite a different matter when their planting and protection have to be paid for, and their coming to maturity has to be awaited for years. opinion has since been only too truly confirmed, so far as the interest ot European planters (who are at most but temporary residents in the tropics: are concerned, though perhaps the plantations undertaken by Government may ultimately prove of considerable value to the country. \*

#### PLANTS WHICH YIELD CAOUTCHOUC.

It is perhaps unnecessary to deal exhaustively with this subject, since during what may be called the various spasmodic India-rubber fevers, that have periodically engrossed the attention of planters, the cry has been raised needlessly, as it would now seem, for more and still more Caoutchoucvielding plants. The natural result has followed, namely, small fortunes made by adventurers and powerful advertisements obtained for would-be public benefactors at the expense of the earnest workers in tropical fields» who now suffer in their present apathy the consequences of undue haste. It is probable that much time and money were spent on experiments with worthless milky shrubs, or climbers, that necessitated a more expensive system of cultivation than the value of the produce obtained. The public were thereby compelled to consider as caoutchouc-yielding a far larger number of plants than there was any occasion for, and the merits of the commercial-rubber trees were thereby largely neglected. Even with the true caoutchouc-yielding plants legitimate experiments in testing the suitability of soils, climates, and methods of treatment were subordinated to hallucinations of immediate fortunes which were to now from saplings" of a few years' growth. Indeed, few subjects of commercial importance have been dealt with in the same spirit of precipitation as the India-rubber enquiry. But this is perhaps accounted for by the practically unprecedented growth of the European manufactures to meet which an almost inexhaustible supply of raw material existed and could be remuneratively furnish\* ed by the indigenous forests of tropical America.

The caoutchouc-yielding plants that alone need be discussed here may be dealt with very briefly in alphabetical order, under two sections-(A) Indigenous. (B) Introduced.

(A). INDIGENOUS CAOUTCHOUC-YIELDING PLANTS. (For B. see page 364.)

1. Artocarpus Chaplasha, Roxb ; Die. Econ. Prod., /., 329; URTICACEJE. Vern.—Chaplash, BENG.; Sam, Ass.; Cha/n<sub>t</sub> CACHAR; Pani, MAGH.J Taungheinni, BURM.; Kaita-da, AND.

References.— Fl. Br. Ind., V., 543; Roxb., Asiatick Researches, y.; also FL Ind., Ed. C.B.C., 634, 640; Kurz, For. Fl. Burm., II., 432.

Habitat.—A lofty deciduous tree of the trans-Gangetic regions from the Nepal Tarai to Assam, Chittagong, Burma, and the Andaman Islands.

Caoutchouc.—Kurz remarks that it yields a tenacious milky caout-This same fact is alluded to by other writers, but the substance chouc. does not appear to have been commercially investigated.

2. A. integrifolia, Linn.; Die. Econ. Prod., 1., 330.

A. Integrationa, Lance, 2017 THE JACK-FRUIT TREE. ern.—Kánthál, f<sup>aiol</sup>> \*''''«\*> <sup>HIND</sup>-» BENG., and Ass.; Poros, KOL.J Phanas, MAR., BOMB.; PiU<sub>9</sub> TAM.; PeinnS, BURM.

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**INDIGENOUS** 

CAOUT-CHOUC.

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(G. Watt) INDIA-RUBBER. The Jack-fruit Tree.

| <b>References.</b> —Fl. <b>Br.</b> Ind. <sup>9</sup> V., 541; Roxb. <sup>9</sup> Fl. Ind., Ed. C.B.C., 633;<br>Brandis, For. Fl, 425; Kurz, For. FL Burnt., II., 432; Dalz. and Gibs.,<br>Bomb. FL, 244; AgriHort. Soc. Trans. (1837), Vol. V., 38-42 {an in-<br>teresting paper by Dr. Heifer on various Assam rubbers): report o?i the<br>samples, pp. 74-78.                                                                                                                                                                                              | INDIGENOUS<br>CAOUT-<br>CHOUC. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Habitat. <sup>A</sup> A large evergreen tree, a native of the forests of the Western<br>Gháts : cultivated for its fruit throughout the hotter parts of India.<br>Caoutchouc.—A writer in the <i>Indian Agriculturist</i> discusses the pro-<br>perties of this rubber. He says it is elastic, leathery, water-resisting, &c.<br>frach green fruit, he remarks, yields about two ounces of milk from which a<br>drachm and a half of caoutchouc may be obtained. Many years ago                                                                              |                                |
| (1837) Dr. Heifer experimented with this rubber in Assam. He wrote,<br>"The milky juice emanating in moderate quantity from every part of the<br>tree, but most copiously from the immature fruits, has till now not been<br>transformed by me in a perfectly solid state. Pouring the milky juice<br>fresh from the tree in earthen moulds as is done in America, did not                                                                                                                                                                                   |                                |
| answer the purpose; the moulds exposed to a slow fire, instead of drying<br>the substance, rendered it more fluid, and so it continued for weeks."<br>Dr. Heifer's process for obtaining the Caoutchouc, he thus describes:—<br>"The milky juice brought in a flat basin is mixed with an equal quantity<br>of water, and then agitated for two hours with sticks, by which a good                                                                                                                                                                           |                                |
| deal of carbonic acid is evolved. In about an hour the caoutchouc sub-<br>stance begins to separate from the water and extractive matter and co-<br>agulates; in one hour more the separation is perfectly effected, the caout-<br>chouc gets a milk-white appearance and a tolerable consistency, but it<br>does not dry perfectly." Dr. Heifer also describes a further process:<br>"The juice, after having been agitated about one hour as above mention-                                                                                                |                                |
| ed, I added to the fluid, acetic acid, which had the property of separating<br>the thinner parts of the juice at once by coagulating it. I put it then on<br>a moderate fire in a tin vessel, till the aqueous parts were evaporated and<br>obtained the caoutchouc substance more elastic, but perfect dryness re-<br>mained a desideratum."                                                                                                                                                                                                                |                                |
| 3. Carissa (several species); <i>Diet. Econ. Prod., II.,</i> 765/ApocYNACR.ffi.<br>These milk-giving shrubs are said to afford caoutchouc, and if of suffi-<br>ciently good quality and in such abundance as to make its collection remu-<br>nerative, these plants should prove of great value to India, since they exist<br>in great abundance though hitherto viewed as worthless. Mr. T. Christy<br>is reported to have sold the seeds of an African species at six pence each,<br>but nothing more has been heard of these reputed caoutchouc plants. A | 59                             |
| climber spoken of as Carissa macrophylla (see Report, Botanic Gardens,<br>Nilghiri Hills, 1883-84, p. g) was experimentally cultivated as a possible<br>source of rubber, but with no result. It is probable the plant in question<br>was Carissa suavissima, a lofty climber of the Deccan Peninsula. The<br>rubber of an African species was collected by Sir J. Kirk (Livingstone<br>Expedition), and much correspondence ensued for some years after, the                                                                                                |                                |
| seeds of perhaps several species having been distributed to planters in the<br><sup>tr</sup> °P <sup>i</sup> ^s- "[APOCYNACEJE.<br>4. Chonemorpha macrophylla, G. Don.: Diet. Econ. Prod., II., 271;                                                                                                                                                                                                                                                                                                                                                         | 60                             |
| <b>Vern.</b> — <i>Garbadero</i> , HIND.; <i>Yokchounrik</i> , LEPCHA; <i>Harké</i> , SYLHET.<br><b>References.</b> — <i>Echites macrophylla</i> , <i>Roxb.</i> , <i>Fl. Ind.</i> , <i>Ed. C.B.C.</i> , 246.                                                                                                                                                                                                                                                                                                                                                  | 60                             |
| Habitat.—A large climbing shrub met with in North and East Bengal<br>and the moist sub-tropical forests of India, generally from Kumdon (4,500<br>feet) to Travancore, the Andaman Islands, Malacca, and Ceylon.                                                                                                                                                                                                                                                                                                                                             |                                |
| Caoutchouc—Gamble {List of Trees, Shrubs and Climbers of Darjel-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |

\*M > 56) s<sup>avs that</sup> this climber gives a good sort of caoutchouc. Other writers allude to this fact, but apparently derive their information from the

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| INDIA-RUB                | BER. Indigenous Caoutchouc-yielding Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDIGENOUS<br>CAOUTCHOUG | statements made by ${}^{1}J^{/1ason an} <*$ Parish regarding the plant they identi-<br>as Echites macrophylla, <i>Wight</i> , which see under Urceola esculenta.                                                                                                                                                                                                                                                                                                                                                                                   |
| 61                       | 5- <sup>C</sup> Wtostegia grandiflora, /?. Br.; Diet Econ, Pro**!TM^**'<br>R*TWT <sup>Vlla</sup> Aatitoak Adi, MAR.; Palay, MAL.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                          | <sup>AC</sup> <sub>n</sub> ; <sup>Trans</sup> <sub>SM</sub> <sup>rL:Hort Soc Ind II (1837), 223: Wight, Ic,<br/>4,832; Date, and Gibs., Bomb. Fl. Supp.<sub>f</sub> S4; AgriHort.Soc. Jour-<br/><b>Har</b>, 183-84, jok Bot% Gard Hyderabad, Sind, 1882; Re?, Dir. Agri.<br/><i>Bomb</i>, 188J-84; Tropical Agriculturist, 11., 160; Indian Forester,<br/>202.</sup>                                                                                                                                                                               |
|                          | <b>Haditat.</b> —An extensiv 2 climber supposed to be a native of Africa but                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                          | b a v w S K r $\wedge$ full account of the r «*nt experiments made in Bom-<br>II., 6« Th/r 'ft <sup>a So</sup> ? <sup>rce of nhher</sup> win be fo^d '" this work, Vol.<br>one) setml £ hf K ucc Issaid to be $g^{00*1}$ *>* the opinion (a natural                                                                                                                                                                                                                                                                                                |
|                          | Amber grown in thJ°R <sup>W</sup> PnCe <sub>A</sub> A Wallich writing OI » specimen of *1"<br><b>rubber s Si S in whSL Tanfi</b> ticity to that of Ficus elastic*. This<br>opinion was pivin at the commencement of the enquiry into Indian sources<br>of TMbh I?nI wI. probably very muchoverstate3. The Concervator of                                                                                                                                                                                                                           |
| 62                       | 2 Plains The v<br>dules a very him and superior rubber."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 02                       | 6. Ficuai elastka, Roxb., Diet. Econ. Prod., III., 350; URTICACK*<br>THE CAOUTCHOUC TREE OP ASSAM.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                          | <ul> <li>Veri,, or, attak bar, 5."</li> <li>Ass., «M. kasmir, KHASIA J &lt; «M. GARO esu, NEPAL; ro<sup>*</sup>, LEPCHA; Nyaung bawdi, BURM.</li> <li>References Roxb., FI/t n « C.B.C., 64044, also his earlier pat" on Caoutchouc in theia Marches, Vol. A; Royle, Prod. Residua, 14, 68, 15-77; Collins' S#* "Caoutchouc, 19-22, 32-39, 4f; Hithe last passage containing S# D. BrandW. Review of Mr. Collini report); Griffith, report on far thank Marches, Vol. A; Royle, Prod. Residuation, 132; Strettel Warrative of f. Assami,</li></ul> |
| i                        | <b>1886-87, 133-136, 139-142, 145-156, 211</b> *24, 169, 167, 164, App. 1/1, 1886-87, 133-136, 139-142, 145-156, 211*244, App. III., IV., and V.;<br>88, 120, 125, 129, 131-139, 191, 192, 215, App. VII., VIII., and IX.,<br><b>I. 62</b>                                                                                                                                                                                                                                                                                                         |

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Ficus elastica—the Assam Rubber. (G. Watt) INDIA-RUBBER.

Gazetteers -.—Mysore and Coorg, /., 70; ///., 25; Madras Man. Admin /., 360: Official Correspondence in Revenue and Agricultural Department (Forests) on Ficus elastica and also introduced rubber plants from 1869 to present date.

**Habitat.**—A large evergreen tree, usually epiphytic in its young stage, but finally or originally rooting in the ground and sending down aerial roots from its branches. It is found in the damp forests at the base of the Sikkim Himalaya and eastward to Assam, Chittagong, and Burma.

Fuller particulars regarding the natural and acclimatised habitat of this tree will be found in the details given in a further paragraph regarding its CULTIVATION as a source of rubber; see also under Ficus, **Vol. III.**, **350** 

**Caoutchouc**—The rubber of Indian commerce, originally derived from the regions inhabited by savage tribes on the frontier of Assam and Chittagong, is produced from this tree. It is now extensively cultivated and is perhaps the only rubber plant in India which can be said to give indications of a future greatly extended commercial importance.

# HISTORY OF THE CAOUTCHOUC OF FICUS ELASTICA.

The earliest writer on this subject was the late Dr. Roxburgh, whose attention was directed to the rubber on a vessel containing honey sent to him from Sylhet. He described the plant that yielded the Sylhet elastic water-proofing gum in the 5th Volume of the Asiatick Researches, but his remarks in his subsequent *Flora Indica* contain the main facts, and as being of historic interest these may be here quoted : "Towards the close of 1810, Mr. Matthew Richard Smith of Sylhet sent me a vessel, there called a Turong, filled with honey in the very state in which it had been brought from the fundua or Juntipoor Mountains north of Sylhet. The vessel was a common or rather coarse basket in the shape of a four-cornered, widemouthed bottle, made of split rattans, several species of whic'i grow in abundance among the above-mentioned mountains, and contained about two gallons. Mr. Smith observed that the inside of the vessel was smeared over with the juice of a tree which grows on the mountains. I was therefore more anxious to examine the nature of this l'ning than the quality of the honey. The *Turong* was, therefore, emptied and washed out, when to my gratification I found it very perfectly lined with a thin coat of caoutchouc." Several more recent writers assert that the Natives of Assam have for ages been acquainted with the properties of gum-elastic, using it to water-proof theirbaskets and to burn as candles. Mr. Smith was thus the actual European discoverer of Assam caoutchouc, since he thought it necessary to draw Dr. Roxburgh's attention to the same, and thought it necessary to draw Dr. Roxburgh's attention to the same, and he was also the agent through whom Dr. Roxburgh was enabled to prosecute the enquiry that finally led to its determination. Interest in India was thus awakened in caoutchouc, and the writings of subsequent investigators for several years were replete with reports on the subject. The resources of Assam were at once drawn upon, and a system of reck-less ^extermination of all accessible trees took place without any real pro-gress towards establishing a commercial industry. With the decline of the Assam supply interest died out as suddenly as it had been awakened, but it may serve a useful purpose to review the early literature of Indian but it may serve a useful purpose to review the early literature of Indian caoutchouc prior to the revival which was consequent on the introduction of the American rubber plants into Asia.

In the Transactions of the Agri.-Horticultural Society of India {Vol. VI., 29) mention is made of a sample of Sylhet rubber sent to Sir D. Brewster by Mr. Q. Swinton, which, after being in Edinburgh for eleven years, was found to possess its elasticity and to be superior to the South

HISTORY.

ASSAM RÜBBER.

#### **INDIA-RUBBER.**

I. 63

Indigenous Caoutchouc-yielding Plants.

HISTORY. **A** erc  $C^{r,ub}(e^{-r})$  in H ft htness of colour and freedom from smell. The in S T if  $M^{r,ub}(e^{-r})$  whom  $M^{r,u}$  S  $M^{r,u}(e^{-r})$  on submitted the sample regretted their WQ: P1?  $S^{W,2}$  an  $(e^{-r})^{1nion}$  as to its value. In that year, however, rubber was selling in London at 2 shillings a pound. thJUJ,<sup>32</sup> J<sup>",eutenant</sup> onar!ton wrote that Ficus elastica was abundant throughout Assam and yielded a copious supply of the gum-elastic. In  $10_{37>}$  Dr. N  $_{*}$  W  $_{2}$  lbch Placed before the Agri.-Horticultural Society of UJ an ext of the price been the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the frequencies of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri.-Horticultural Society 1836 J H an ext of the Agri. Dr Royle then up and the desirability of starting rubber cultivation in Assam, and stat **Fiscall**, alto stated that the facts made known by KONDUIGN regarding **Ficus elastica** had astonished the home authorities who had formed the opinion that rubi d astonished the home authorities who had formed the me publication Jfih?\*/ excl usively a American product. Shortly after M K t S S r t. FM ^ 1 ? ^ facts, a sample of Assam caoutchouc was col-ind forwarded to the Society by Captain Jen-limeter and the facts as a sample of the society by Captain Jen-limeter and the facts as a sample of the society by Captain Jen-limeter and the society by Captain Jen-Committee of the Agri.-Horticultural Society. The Committee wrote: "This proof of one of the many great commercial resources abounding in Assam is highly encou Assam is highly encouwaging." Again, « Vo, ir Committee regret that they have it not in their power to afford Captain Jenkins any information as to the value of caouttinouc in the Calcutta market, since it is altogether a new article, and has as yet been exported only by parties interested in keeping the SET 3? T i W j<sup>n</sup>, t<sup>n</sup> without wishing ^inspire extravagant hopes of  $si_A \cdot A \downarrow ^{6} f ^{6} \downarrow J^{U8tified in offer}$  ng it as their opinion, that there is a ready is a ready market in England to takeoff a very large quantity, and that there would be no great difficulty in finding parties in Galentta willing to make advances to a reasonable extent. The Committee would be glaa, make advances to a reasonable extent. The Committee would be glaa, however, to ascertain from Oaptain Jenkins, by actual test, at what rate would bT vato Thil'n ?<sup>SSam</sup> Pf<sup>bazdr</sup> »«» U whout which data it exported from CaSta 1?<sup>y</sup>t<sup>1</sup> n<sup>duC</sup> 1<sup>nem</sup> The ^antity of caoutchouc the tota. • w O T f i ' i & o a . A j d.l<sub>a</sub> , <sup>1</sup><sub>1</sub>U, which may be taken af maunds, paying duty on a nominal value of RA 112 or R8 per maunat a those who have advan erf  $tf = J^{and which at}$  present is known on y to report, on samples  $Dreotr^{\wedge d procured il}$  from, the forests." In a later report, on samples Dreotr ^ ^d procured il from, the forests." In a later that "no do X can b^ nn TM A<sup>SSan</sup>? by <sup>Dr</sup> - <sup>Sc</sup> «>tt, the Committee stated competing wkh an<sub>Vp</sub>?<sub>ct</sub>7<sub>t</sub>r<sup>terta</sup>, <sup>ined</sup> that Assam is quite capable of ttinad what quantiti-the c^, ^e & orld, and !t only remains to to ^ In 1838, CaptainA\_W ^ " ^ Ual to the production of." Akyab; Leutenan, « w S <sup>#</sup> | <sup>f a n</sup> T <sup>e d</sup> samp'es of Caoutchouc. from MacfarquharfromTavov <sup>y</sup>? nil<sup>rOm</sup> Assam; and so also Oapta«" M-ciety presented ite POH ^ j.<sup>th</sup> e f ame y<sup>ear</sup> the Agri.-Horticultural So-Assam rubbeTaudtheT<sub>n</sub>?H<sup>ear</sup> r<sup>0</sup> <sup>Lieute</sup>" ant Vetch, for one maund. of their f.li ZJZl<sup>a</sup>"d' London Caoutchouc Company, while not awarding that theSL ^e was not pregared in such a manner as to allow their giv<sup>n</sup>8 <sup>eee</sup> ve from Mr. Robert Smith pieces of cloth which he had rendereo , Cmf,WiUl  $\wedge$  moien trades page ««•

### • Ficus elastica-the Assam Rubber. (G Watt.) INDIA-RUBBER.

not the smallest doubt of this becoming" an extensive article of Indian commerce, if managed with moderate prudence."

In their annual report for the year 1839, the Agri .-Horticultural Society stated that the caoutchouc from Ficus elastica is liable to decomposition In the same year a Committee of the Society of Arts reported on Captain Jenkins' and Lieutenant Vetch's samples of Assam rubber, pronouncing the former superior to the latter. In the Proceedings of 1843 it <sup>1s</sup> complained that few of the samples of Assam rubber examined by the Society have been carefully enough prepared to resist the damp and heat of the Calcutta climate.

In 1852, Dr. Falconer, commenting on a decline in the Assam traffic in Caoutchouc, and in answer to certain questions as to the best modes and position of tapping the trees, threw out the suggestion that the decomposition Assam Caoutchouc was liable to was probably due to the mixing "f the milk obtained from the roots with that from the stem. He contended that the milk being obtained from the descending sap of the plant which had been elaborated in the leaves was probably in its more perfect state high up the stem than in the lower portions, and hence he urged that tapping should be made on the branches instead of on the roots and lower part of the stem. He recommended that this theory should be investigated by keeping the milk from the various psrts of the plant distinct until it was seen which of these imparted to the mixture the soft and adhesive property complained of by the manufacturers. Careful preparation and above all the avoidance of mixing *other* milky saps with that of the true rubber plant would effect great improvements, but it must be here added that Dr. Falconer's suggested explanation is at variance with the accepted physiological conception of the character and movement of the laticiferous fluid. It is quite distinct from the elaborated descending sap of the plant, and its motion is /n reality from the older to the newer structures or upwards instead of downwards. The caoutchouc grafiules contained within it are useless excretary materials which when once formed are probably never again chemically altered, so that but for the other ingredients of the milk it would be quite immaterial from what part of the stem or root it was drawn. The question, however, as to the part which could be tapped with least injury to the plant would have to be answered in favour of Dr. Falconer's recommendations.

In a most instructive report, from the pen of Mr. G. Mann, Conservator of Forests, Assam (Progress Report of Forest Administration in Bengal for the year 1868-69 5 reprinted Jour. Agri.-Hort. Sac, India (New Series<sup>^</sup>, Selections, 70-81), many facts are given regarding the destructive methods of tapping pursued in Durrang and other districts of Assam. In 1865, "<sup>ne</sup> privilege of tapping in the Government Forests between the Bor Nuddy and the Moora Dhunseeree Nuddy was sold for R 1,012 to Kyabs in the Mungledye Bazar. These contractors purchased from the people who worked the forests 2,500 maunds of rubber, " but had not," Mr. Mann remarks, "the slightest control over the tapping" of the trees] and encouraged the latter as much as in their power to obtain the largest possible quantity during the short time they held the monopoly of buying it, consistent with their interests without any regard, however, for future supplies, which was of most disastrous consequence, in so far as it induced the men who tapped and collected the rubber to indulge in the most outrageous wholesale destruction of these valuable trees, by either telling them with axe, or, if this was too troublesome, to collect firewood and burn them down, so as to render the operation of tapping more convenient than it would have been had the trees were counted, in all direcASSAM RUBBER.

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| INDIA-RUE | BBER. Indigenous Caoutchouc-yielding Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| HISTORY.  | tions, lying on the ground with cuts across their trunks and roots from 6 to 18 inches long, 3 inches broad, and a foot to 18 inches apart, with smaller cuts on the upper branches, by which all that they could yield was extracted immediately after they were felled, with utter disregard tor tuture wants." A less immediately destructive system was pursued in other parts of the province, which, nevertheless, in time resulted in the trees losing their power of yielding the milk. Messrs. Martin, Ritchle « 00. of Tezpore, for example, got the exclusive right of tapping over a certain tract of forests for fiften years from 1852 and free of payment, but on condition that tapping should only be made between the 1st of November and the 30th April, and that yearly they should plant 200 caoutchoucyielding trees. The trees, however, embraced by this concession' got exhausted, and one year before the tern fixed Messrs. Martin, Ritchle. of C. discontinued tapping them, because, as Mr. Mann remarks, pubber could not now be drawn from them at a remunerative price. Continuous tapping for six months year after year, Mr. Mann affirms, will kill the trees, and accordingly he urged either that tapping of forests more frequently than once every three years. Martin, Ritchle. of the every three years. Mr. Mann concludes his remarks on the exhaustion of the Assam rubber supply by saying that "unless the time of collecting is much more limited and some plantations are started to provide for iuture supplies, there will he no more rubber procurable from these forests a few years here, and their yield of caoutchouc. "Assuming that a tree reaches its full size at fifty years without tapping, and would after that yield every the year which yield was per maund, whilst it fetches R15 ac mand, and should realise the present price of good rubber, <i>viz.</i> R35 per maund, it would have a net profit of R20 per tree every threy years which is a portic of R5 at leash per tree such more than the tope in adus of rubber tradus at this per maund, and shoul |
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#### Ficus elastica—the Assam Rubber. (G. Watt) INDIA-RUBBER.

soon rose to R5 for the best or thickest procured from the roots, and 84 for the next best procured from the lower part of the stem, and £3 for the worst supposed to come from the upper branches of the tree and to have been mixed with the juice of other species of Figs and water." The italics nave been given here to contrast this opinion with that given above in Dr. Falconer's suggested explanation of the inferiority of Assam rubber; Dr. Falconer held that it would be found that the most inferior rubber would likely be found to be that drawn from the roots and lower part of the stem.

Since the year 1869 (the date of Mr. Mann's report which has been so frequently placed under quotation above), the Government have started caoutchouc plantations of Ficus elastica in Assam. But it seems likely that, had the similar recommendation made by Dr. Royle in 1839 been acted ^pon, India would have now possessed a flourishing caoutchouc industry. Mr. Mann tells us that the total revenue derived by Government from Assam rubber between the years 1861 and 1870 amounted to <sup>R8</sup>3»733» the total for the last year (1869-70) having been 823,940. That small sum, thtrefore, practically (or only a portion of it) was the purchase money for a right to exterminate or ruin the Ficus elastica trees within British Indian territory And so completely had this been accomplished that we read of contractors abandoning rubber collection before the expiration of the terms of their concessions.

Mr. Charles Brown low in 1869 \Jour. Agri.-Hort. Soc, New Series,  $??rr * > 3^{)}$  started on a journey up the valley of the Jatinga in Cachar, with the object of studying among other things the India-rubber of that neighbourhood. His account is most instructive, but want of space prohibits more than a mere mention of one or two of the points he Drings out. The tree, germinating on other trees as an epiphyte, sends down immense aerial roots and from the top of these (often at a great height above the ground) produces its horizontal branches and dome of boughs and  $\mathbf{R}^{\mathsf{ves}_{1}} \wedge e^{\mathsf{r} \circ o t \, \mathsf{s} \, t_1 \, i \, \mathsf{at a r e}} \, ^{\mathsf{tare ta}} PP^{\mathsf{e} \wedge \mathsf{w}} \, ^{\mathsf{anc} \ast}$  to which allusion has been made above, are these aerial roots which at first sight look like unbranched stems. Speaking of this great tree Mr. Brownlow says : --- '' Among forest trees and in regard to dimensions, this is 'facile princeps,' and there is no other, not even the Banyan, that approaches it in dimensions and grandeur. Again, •• It will be observed that every portion below the head of the foster tree is strictly root and incapable of throwing out a branch, and as the head <sup>15</sup> u<sup>arefv less than 60 to 1()0 feet</sup> high, it is no easy matter to procure throw out smaller and subsidiary rootlets of all thicknesses down to that of twine. If any of these be cut they die below, but from above grow again downwards. . . It is only necessary to see the tree to appreciate the fearful risk encountered by the gum gatherers, who by no means confine their operations to the base, but climb up as high as the roots extend and higher along the horizontal branches, chopping with their dhaus at intervals of every few inches, the cuts answering as well for their foothold as for the sap to exude from. . . Were the base of the tree alone tapped the yield would be very insignificant, especially in trees that have been frequently tapped before. And as the trees occur very sparsely, and long distances have to be gone over to meet them, it becomes an object to get as much off at each cutting as possible. The tree must be twice climbed, once to cut it and a second time after the gum has dried (which takes a day or two) to gather it. This is done by pulling off the tear which gathers below the wound, which brings away with it all the gum that has exuded, and these tears have only to be moulded together to agglutinate into a ball. The quantity that can thus be collected at one cutting does not exceed 4 to 5

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Indigenous Caoutchouc-yielding Plants.

HISTORY. seers (8 to ioft) Of course, no mercy is shown to the trees, all of which (at least those that 1 saw) suffer severely; many, I was assured, are killed outright. The damage they sustain is apparent in the large cankers, and buttresses rotted off, owing to the bark bring unable to heal over the frequent wounds they have received all round. The foliage is wanting in luxuriance, and dried branches and roots lying about testify to the injury in health that the tree has sustained. . . At present the trees are having a long respite which will no doubt do them good, but it is only-owing to a clause in the conditions of Government which provides that the monopolist shall, at his own cost, plant a certain number of trees yearly . . Practice will soon show how the gum should be gathered ; probably the best plan would be by scoring the bark on one side (not chopping it and leaving the other half "of the bark to carry on the circulation". Of course, the only season in which the gathering is practicable is the dry months; during the rains the tears would be washed away before they had time to solidify. The rubber trade of Cachar amounts to about 2,000 maunds per month during the dry months (November to April). The price at which the gatherers sell averages from R20 to R25 per maund." Mr. Mann states that in Assam in 1868 there were sold in Mungledye Bazár 2,500 maunds, in Tezpore about the same quantity, and in Chydooar 1,500 maunds. For the year in question there was sold in Assam and Cachar close on 9,000 maunds, but of course a large proportion of that amount was drawn from trees beyond the Assam frontier.

It will thus be observed that from 1810 to 1839 <sup>1</sup><sup>A</sup> e keenest possible interest was taken in the subject of Assam rubber. From the latter date the defects of the substance were spoken of as damaging its further development as an article of European consumption, and various theories were advanced as to the cause of this. It seems only natural since the earlier reports speak highly of Assam rubber and recommend as necessary a peculiar method of collection, a method adapted to the then known way of utilising rubber, that the defects subsequently complained of were due to adulteration or selfish and exhaustive extraction that sacrificed quality to bulk. About this time also the alarm of extermination was established and down to 1869 various reports and regulations of Government appeared which aimed at checking the danger anticipated. The Journals of the Agri.-Horticultural Society of India which, for twenty years became the enlightened medium of disseminating information regarding Assam rubber, were from 1839 practically silent on the subject, until a new interest, and perhaps, though this could not have been foreseen, an unfortunate one, was awakened in 1872-73 by the expectations of immediate fortunes to be made from the superior rubber-yielding trees of tropical America and the figantic climbers of Africa. Some of these introduced plants have taken indly, however, to certain districts of India, and may yet come to be a source of wealth in their new homes; but they have by no means fulfilled the high expectations once entertained. Indeed, it may confidently be stated that even from the present date it will take some time before the money spent on their introduction will be recouped to the planter or to Government Greater success may, in fact, be looked for from the efforts put forth by the Assam Government to regulate and resuscitate the forests of Ficus elastica.

| ~ | Ficus elastica—the Assam Rubber. [G. Watt.) INDIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -RUBBER.         |
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|   | commonly mixed. The caoutchouc which was collected and prepared by<br>Messrs. Martin, Ritchie & Co. of Tezpore, while they had the lease<br>of the caoutchouc forests previous to 1865, and which was known in the<br>London market under the name of <sup>8</sup> Fine slab Assam,' was a very superior<br>article, and quite lately an improvement has again taken place in the<br>quality of the Assam product.<br>"'Mr. Mann thinks that apart from the accidental (and sometimes inten-<br>tional) impurities, such as pieces of bark, wood, sand, stones, the Assam<br>article is often adulterated with the milk of other species of Ficus, which<br><sup>*</sup> s of a quality much inferior to the milk of F. elastica. Messrs. Martin<br>&• Ritchie are said to have given up their lease before it had expired,<br>because the supply had diminished so far that their business was no longer<br>remunerative, and from late reports which I have seen on the subject I<br>gatherrtnat the number of caoutchouc trees remaining in British territory<br>is believed to be limited. Under these circumstances, it does not appear | ASSAM<br>RUBBER. |
| I | likely that any considerable improvement of the article can now be expected<br>to be effected, through the agency of private enterprise, except at the risk<br>of exhausting the remaining sources of supply. The question then arises,<br>whether it is possible in some way or other to place the collection and pre-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |
|   | paration for the market of this valuable article under the control of public<br>officers who will devote their whole time and attention to this subject. No<br>great skill is required for the collection and preparation of a pure and<br>valuable article, the facts stated in Mr. Colh'ns' report and in Mr. Mann's<br>previous papers on the subject will enable any intelligent and careful per-<br>son to arrange and superintend the collection and preparation.<br>"Mr. Mann specially insists on the following points being observed :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |
|   | "(1) Fresh cuts to be made only in February, March, and April, and<br>the tre <sup>A</sup> s to have rest for two years between each tapping.<br>,"(2) The cuts to beat least 18 inches apart, to penetrate into the bark<br>only, not into the wood, and to be made with an instrument moje suitable<br>than the ones at present used. Mr. Mann prefers the German timber<br>scoring knife.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ,                |
|   | <ul> <li>"(3; As far as possible, the milk to be collected in a fluid state in narrow-mouthed rattan baskets, and to be brought to central manufactories.</li> <li>"(4) Endeavours to be made to convert the milk into a solid state by a process of slow drying similar to that practised in Pari.</li> <li>"(5) In case this method should not succeed, then the process employed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |
|   | <ul> <li>by Messrs. Martin &amp; Ritchie to be followed.</li> <li>"(6) Those varieties of caoutchouc which dry naturally on the tree to be collected with care, and to be picked so as to get rid of all impurities.</li> <li>'• So much, however, is evident that unless the collection and preparation of the caoutchouc produced in British territory is placed under the control of public officers who have an interest in the protection and improvement of</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |
|   | the forests, no satisfactory result can be expected. If this is not practic-<br>able, then we must for future improvements entirely rely on the caoutchouc<br>plantations to be established.<br>"Under all circumstances plantations of the Ficus elastica should be<br>commenced at once in Assam on a large scale. The tree strikes readily<br>from cuttings; its cultivation therefore is easier than that of most other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |
|   | trees. In one of his first reports on the subject Mr. Mann suggests that<br>lines be cleared through the forest, and that cuttings, as large as possible,<br>be planted at convenient distances on either side of these lines. Very<br>likely this would be a good plan to begin with, and as the carriage of big<br>cuttings over long distances would be expensive, nursery beds should be<br>prepared and enclosed for the growth of such cuttings from small slips. If<br>suitable soil **nd localities are selected, and if these plantations are at                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |

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Indigenous Caoutchouc-yielding Plants.

once placed under efficient supervision, there ought to be no difficulty in this undertaking, and operations should in my opinion be commenced as soon as possible on a large scale, and in accordance with a wellconsidered plan."

Mr. Mann's report for 1884 gives the result of the experiments in the cultivation of Ficus elastica in Assam; the following passages from that report may be given here :—

"The past history of rubber plantations in Assam, and, for the matter of that, in India, dates from the year 1872, when Mr. James Collins was charged by Her Majesty's Secretary of State for India to prepare a report on the caoutchouc or If<sup>TM</sup> rubber of Commerce, the plants yielding it, their geographical distribution, and the possibility of their cultivation and acclimatisation in India. The only rubber-tree indigenous in India (Ficus elastica) is noticed on pages 19 to 21, 32 to 39, and 48 to 54 of that report.

"This report was largely circulated by Government in this country, and the <sup>at</sup>J<sup>e</sup>•" tion of Local Governments was directed to the necessity of protecting the trees wnich yielded this valuable commodity, because it had become quite evident that the caout-chouc-trees were being recklessly destroyed in all parts of the world, and particularly so in Assam, which is, so to speak, the only province in India where caoutchouc-trees grow, and the experimental cultivation of the indigenous rubber-tree (FICUS elastica) was accordingly ordered in May 1873 by His Honour the Lieutenant-Governof ot Bengal. But by the time these orders reached the Commissioner of Assam the season was so much advanced that but little could be done that summer, because there was only one small iorest plantation with a resident forest officer in existence at that time, and this was at the Kulsi river, which is not as favourable a locality as the Charduar in the Darrang district. In the latter district forest work had not been started, and, consequently, the first commencement in the present Chardua< rubber plantation was not made until the next cold season. A detailed account of these first attempts at planting rubber will be found in paragraphs 80 to 114 of the Assam Forest Report for 1873-74.

"A particular impetus was given to this work by the complications and difficulties that had arisen at about the same time in the proper management of and cuntrol over the India-rubber trade in this province, brought on by competing speculators, which had necessitated an order from the Supreme Government that the operations of the Forest Department should be limited to conservancy and reproduction of the rubbertrees in certain well-defined areas, and to the collection and manipulation of the pro" duce in such limited areas through their own agency.

"This order of the Government of India was repeated in 1876, and has been acted up to until now: all work in the way of rubber plantations is based on it, and, what is more, the experience gained in the twelve years that have elapsed since the issue of that order has made it clear that the effectual protection of selected areas, *with naturally grown rubber-trees on them*, is next to impossible, on account of the localities where these trees grow being, generally speaking, very inaccessible, and the unequal way in which these trees are scattered about in the forests, as it would mean the protection of enormous areas to ensure anything like the present export of rubber irom Assam, and this in turn would mean the employment of very large establishments to watch over the forests, because rubber is so very portable, and its removal not necessailly confined to roads or tracks, rivers, and so forth, as is the case with timber, and the rubber trade. This simply reduces the whole question of permanently keeping up the export of this valuable product from India to making plantations of the tree that yields it.

" In April 1874 the Government of India called for a special progress report on the caoutchouc plantations in Assam, which was furnished and subsequently printed and circulated with the Governmentol India, Department of Revenue, Agriculture, and Commerce (Forests) letter No. 22, dated the 31st August 1875. The efforts made up to that time in the way of planting caoutchouc-trees in Assam, and all information regarding the yield of caoutchouc-trees then available, have been fully stated in that report.

"The Charduar plantation has, as was maintained from the commencement, proved in every respect the best locality in Assam where the rubber-tree has been planted; the land, it is true, is not high, and so we must, no doabt, have some area planted on J!KL<sup>e</sup>!if<sup>roul</sup> **1**<sup>o</sup> 
#### Ficus'elastica—Cultivation in Assam. (G. Watt.) INDIA-RUBBER.

as the Chief Commissioner has sanctioned an extension of 200 acres. The present area under cultivation is fully stocked, containing 12,511 trees; they have been planted at 25 feet apart in the lines, which latter are 100 feet apart; this is double the number of trees that was planted on an acre at the commencement. The oldest trees are about 30 to 40 feet in height, and a few from 45 to 50 feet, but this cannot be put **down as the average growth of Ficus elastica** in ten years, since half this time, and longeir, these plantations were entirely experimental and everything had to be learned, as, for instance the first trees were ull mined from suttings, which mode of mode of mode wor has antirely been given up, since the trees raised from seed have proved much hardier and faster growing, and as to the planting of rubber seedIngs high up in the forks of other trees, this also has almost entirely been given up, because such trees in most instances did not make more than a tew leaves in the year, and "it would, as a matter of course, be out of the question to plant rubber-trees where they would take a century to become large enough for tapping, when such trees can be grown in a different way in one-fourth this time. " On the other hand, it has been found that trees planted on small mounds of earth,

" On the other hand, it has been found that trees planted on small mounds of earth, 3 to 4 feet in height, grow very much better than if they are planted on ordinary level ground, and this plan has therefore also been adopted, although it adds considerably to the cost of making these plantations, but the faster growth of the trees amply compensates for the higher expenditure.

"The method of planting adopted from the beginning has been to dear lines from e?st, to west^ through the forest for the young trees a hundred feet apart; the width or the lines is 40 feet, so that a broad strip of forest 60 teet wide is left standing between these lines, to ensure the utmost amount of moisture in the atmosphere for the young rubber-trees. At first, the lines were only cleared 20 teet broad, but it was found after a few years that these closed up very soon, ar.d thus retarded the growth of the young trees by shutting out the requisite amount of light. However, the widening of the lines also brought about the faster growth of the scrub in them, besides that of the rubber-trees, and more money, time, and attention has in consequence to be spent, especially in the rainy season, on those plantations, than had at first been anticipated; but the greatest and most costly difficulty that had to be overcome was the effectual protection of the rubber-trees against deer, which during the first few years constantly bit off the young plants, and, where they were not entirely ruined by this, they were so much injured and retarded in growth that a considerable increase in the expenditure on these plantations had to be incurred or?fencing- to prevent it. But for the future this expenditure will not be necessary, since it has been found that saplings 10 feet and more in height can b^ transplanted without difficulty and with pertect success, and if such saplings are tied firmly to stakes the deer can do little or no damage to them.

"The efforts made to inter plant with timber trees besides the rubber, so as to obtain a yield ot timber in addition to that of caoutchouc, have up to the present met with but partial success in the Charduar plantation, but there is no reason to doubt that this will soon improve, as the officer in charge gains more experience; in the rubber plantation at the Kulsi in the Kamrup district, this work has been most successful.

<sup>•1</sup> The total area of the Charduar caoutchouc plantation is now 892 acres, and has cost 1\*64,351, or R72 per acre; this is abnormally high, since much of the work dur ing the first five years had to be done twice over, and sometimes of tener, because the planting of caoutchouc trees was new. and everything had to be learned and found out by experiments, which naturally took some time. But matters have changed in this respect; we know now what we are about, and the officer in charge of this work, Mr. T. J. Campbell, has estimated the cost of the extension which is at present being carried out at R29 per acre, to which another R6 for subsequent cultivation and clearing should be added, bringing the cost, including everything, up to R35 per acre.

"Besides the experimental nature of the work, to which the cost of R72 per acre of this plantation must to a great extent be attributed, we have also prepared extensive nurseries, covering an area of about 23 acres, and containing some 184,000 plants of different sizes, which is sufficient to extend the plantation by 200 acres per annum for the next fifteen years, or a square mile per annum for the next five years, if desired and these nurseries have been so planted that, il for special reasons it is considered advisable not to extend the plantation at any particular time, the trees can be kept almost stationary for fifteen to twenty years, without becoming less suited for transplanting, a particular advantage enjoyed by **Ficus elastica** in common with other semi-epiphytes, as compared with ordinary trees

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# Indigenous Caoutchouc-yielding Plants.

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"Thus far I have given an account of the Charduar rubber plantation as an experimental undertaking only, and shown that it has been a perfect success as far as the S'ing of the trees is concerned; but it remains to be considered what the financial  $r \wedge Jr$ of the undertaking are likely to be, since, as I have always held, and do now noia, the financial success of forest management is the only sound basis on which it can \*\*\* permanently established and maintained. To make an even approximately COTV, estimate of the probable revenue that may be expected from these plantations, nestimate of the probable revenue that may be expected from these plantations,  $th_{i}$  estimate of the probable revenue that may be expected from these plantations,  $th_{i}$  first and foremost necessary to know what a rubber-tree will yield, and on this pour our information is most imperfect. The statements made by rubber collectors and the exhausted state of the naturally grown rubber-frees has prevented us until last year from making experiments; the result of last y^st/" interesting as it is, and much as it has increased our knowledge of the yield ot can chouc from **Ficus elastica**, still leaves us in considerable doubt on the subject, as not chouc from **Ficus elastica**, still leaves us in considerable doubt on the subject, as not been stated in paragraph 118 of that report. However, so much is certain, that if ull-grown rubber-tree of about fifty years old will yield at the very lowest^ se end rubber, if very carefully tapped, and this quantity may be expected about sixteen O "1^ which will be an equally safe estimate for calculating the yield of a rubber-tree, i be quite on the safe side, I will only calculate ten trees per acre, which "would fitude to the barrang district and sold, and deducting the expenditure be incurred on collecting it, would give us a net profit of R54 per maund, or R 1,000 per acre in fifty years, and if the rubber-trees have a longer life, the yield may be reckoned for their remaining years of life at the same if not at a higher rate. J " An acre of first-class timber trees would cost about double as much to plant ana

An acre of first-class timber trees would cost about double as much to plant ana maintain; at the rate of sixty trees per acre and taking the value of the trees at Kio each (the present royalty charged), this would give us R600 only, as compared with Ri,080 from rubber, and most of the first-class timber trees will require one hundrea years to reach maturity, or double the time of a rubber-tree; this means, in other "<sup>of</sup> J especially if the compound interest on the capital used is taken into consideration, thas an acre planted with rubber-trees will give about four times as much revenue as a acre planted with first-class timber trees. --r^iiv

acre planted with first-class timber trees. "It may be and in fact has been argued that rubber might be produced a "Incx of factors of the produced a "Incx of factors of the produced a The produce attribute with the produced 
have positively no authentic information to make comparison; but I am very  $P^{o}J$ , ful whether any of them will yield more than **Ficus elastica**, and. certainly, the **diameter** ence, if any, could not be so much as to make the cultivation of the latter unadvisable.

" Of the two exotic rubber-trees which have been tried in Assam,  $vtz_{.9}$  Heven brasiliensis, the Para rubber, and Manihot Glaziovii\* the Ceara rubber, the former has failed completely, as the climate of Assam is altogether too cold for it, iand although the latter tree grows remarkably fast during the first year or two, and seem to thrive very well, its appearance is not at all such as to make me hope that it will do as well as our indigenous trees, much less that it will do better. Nothing positive can be said on this score until experiments with both have been made under carcell super be said on this score until experiments with both have been made under carc«il super-vision by a competent and responsible officer.

Under the circumstances as sketched above, and considering that Assam is the only province in India in which rubber grows to a considerable extent naturally, I  $_{\mu}^{am}$  of opinion that it is a duty of the State to have rubber plantations in this province.

The Government of India supported Mr. Mann's opinion as to its being the duty of the State to organise rubber plantations. Accordingly directions were given in May 1884, that for five years from that date the Assam plantations should be increased by 200 acres a year. Part of that extension, it was recommended, should be situated on higher ground than 1. 63

Ficus elastica—Cultivation in Assam. (G. Watt.) **INDIA-RUBBER.** 

hitherto planted, at Charduar. At the same time, it was added, endeavours should be made to induce private persons to plant India-rubber trees on their estates, seedlings being supplied to them for this purpose at cost price. It was also suggested "that the experimental plantation of Ficus elastica as an epiphyte might with advantage be undertaken by the Forest Department on a somewhat larger scale than has been done up to date. Naturally, rubber generally reproduces itself in this way; and although the growth of the seedlings thus raised is slow at first, the trees are likely to grow to much larger dimensions ultimately. This method of reproduction is, moreover, inexpensive, as the seedlings do not require any attention after they have once been deposited in the upper forks of trees:" The Government of India also desired that in order to test the financial results of the cultivation of this rubber fifty mature trees should be experimentally tapped, year by year. Acting up to these suggestions, the subsequent reports give the results. The area under Ficus elastica was steadily increased and the tapping of the trees proceeded with, showing an inexplicable irregularity year by year, in the amount obtained from each tree. The trees experimentally tapped were numbered from i to 50, and the record of each tree kept, as also the average of all the fifty trees year by year. In 1882-83, the average yield was 4 seers 4 chataks; in 1883-84, 1 seer 1 chatak; in 1884-85, 2 seers 5 chataks; but in this year six new trees (51 to 56) were tapped and gave 12 seers 10 chataks; in 1885-86, 3 seers 4 chataks; but Nos. 51 and 52 were also tapped giving 5 seers 13 chataks; and in 1886-87, 1 seer; but Nos. 55 and 56 were also tapped giving 3 seers 3 chataks. Commenting on these results the Conservator in his annual report says : " The above figures show that the average quantity of rubber yielded by one tree has been less than in any previous year, it being 1 chatak less than in 1883-84. The value in money depends of course on the market, and on t»' ! account is higher than it was in 1883-84. A close examination and comparison of the detailed statement (appendix X.) with those of former years shows that the fluctuations in the yield of one and the same tree, in different years, is often very considerable, and remains up to the present inexplicable, since the officers, under whose personal supervision these experiments were made, have up to date not been able to find out any reasons for, or causes of, these very material fluctuations. It is quite evident that we have as yet much to discover to be able to make an even approximately correct estimate of the yield of rubber trees. As pointed out by Mr. Jellicoe, the difference in yield has been sometimes very remarkable, as, for instance, tree No. 50 gave in 1884-85, 4 seers; in 1885-86, 5 seers 4- chataks, when suddenly in 1886-87, its yield came down to 6 chataks only, and there are other trees, as, for example, Nos. 12, 17, 18, 20, 21, 42, and 49 that show equally remarkable differences in yield between last year and this, which Mr. Jellicoe has not been able to account for in any way. The Conservator feels sure these are not ordinary fluctuations in the yield of rubber trees, and that a much closer watching of this tapping will *l*& necessary in future. The slight but general falling off in the yield of these trees is probably natural, and the figures seem to show that this difference is not due so much to the differences in the seasons as to that in the individual trees. The falling off in the average yield per tree of the six, Nos. 51 to 56, has even been more marked than of the other fifty trees." The Conservator is careful to explain that all the tappings were made on the stem, and that no roots or branches were touched. The tappings commenced about four feet from the ground and were never less than two feet apart. This careful and (considerate system is pointed to as the reason why much less was obtained than is currently reported by native dealers as  $^{2}3^{A}$ 

ASSAM RUBBER.

**INDIA-RUBBER.** 

HISTORY.

Indigenous Caoutchouc-vielding Plants.

the yield. In the report for 1883-84, for example, it is stated," Regarding^ the possible yield of a rubber-tree, instances are veil known in this district" where a large tree has been tapped for the third time, and yielded between 2 and T maunds. Subsequent tappings gave from 4 to 10 seers, but these have not been carried over a sufficiently large number of years to lead to exact conclusions. Of course, this yield was obtained from a mode of tapping very different to what is departmentally adopted : roots, branches, and trunk, receiving as many incisions as they wore capable of bearing."

It is difficult, and perhaps unwise, while compiling from books and reports, to attempt to offer practical suggestions, but it would seem. Ssince the yield of rubber fluctuated and even declined, on the trees which were subjected to the moderate tapping pursued in the Government reserves and plantations, that we have by no means learned the maximum yield commensurate with financial success. The formation of caoutchouc is what may be called a by-product in vegetable economy, though, of course, the milk contains other substances of importance to life. Severe tapping may set up what for the moment could be called an abnormal or diseased condition. But it would seem desirable to ascertain the effect of a much more severe system than that hitherto followed and to tap year by year the maximum amount short of reckless injury to the growing woody structure or complete destruction of the tree. It would, from past experience, be scarcely safe to affirm that the fluctuations or even the decline established the conviction of an injury done to the trees, but rather that whether tapped or not the formation of milk is not constant. A large amount of milk remained in the structures not tapped which might have been removed without doing any greater harm than was done by the tapping of the lower part of the stem. The current of the lacticiferous fluid being upwards rather tjian downwaids it cannot be held that the few cuts made on the stem drained the milk from the whole tree. If these ideas be correct in a year of less formation a smaller quantity would be obtained from a uniform degree of tapping, whether that degree was injuring the tree or not. If we possessed data by which an opinion could be formed as to the maximum yield, until death supervened, it would be possible to fix the degree of  $Ht^{ping}$  the way  $df^{ping}$  the supervened, it would be possible to fix the degree of  $Ht^{ping}$  the true  $f^{ping}$  the supervened  $f^{ping}$  to the true  $f^{ping}$  tothetrue  $f^{ping}$  to the tr 

TRADE. Assam.

TRADE IN INDIA-RUBBER FROM FICUS ELASTICA.

t; J  $\cdot f$  o  $\bigwedge \cdot \overline{} \cdot \overline{} \cdot \overline{} \cdot \overline{} \cdot \overline{} \cdot \overline{} \cdot 2$  \* table S'<sup>lves the im</sup>P<sup>orts from</sup> ^ 0 s s the frontier into Assamand the total exports from Assam during the years 1882-87. In the Forest Department reports the difference between these figures is taken as the probable yield from forests within the British territory:-

| Exports          |           |     | •     |   |   |   | i | 1882-83. | 1883-84. | 1884-85. | 1885-86. | 1886-87-               |
|------------------|-----------|-----|-------|---|---|---|---|----------|----------|----------|----------|------------------------|
|                  | Imports   | •   | •     | : | • | : | • | 9,329    | 9,792    | 7,529    | 6,658    | Mds.<br>4,039<br>1,597 |
| Assam Production | Assam Pro | odu | ction |   | • | • |   | 4,743    | 8,150    | 6,727    | 5,675    | 2,442                  |

I. 64

#### Ficus elastica—in Bengal, Burma, &c. (G. Watt.) INDIA-RUBBER.

BURMA RUBBER. II. BENGAL.—The following note on the caoutchouc of the Chittagong Hill Tracts has been contributed by the Deputy Conservator of Forests: '• The table herewith furnished gives the quantity of rubber brought by the hill tribes to Demagiri, the frontier police ^ost, and sold there to traders:-

| Year.                                                                                                                 | Maunds.                                                                | Seers.                                     | Chataks.                          |
|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------|-----------------------------------|
| 1879-80<br>1880-81<br>1881-83<br>1882-83<br>1883-84<br>1883-84<br>1884-85<br>1885-86<br>1885-86<br>1886-87<br>1887-88 | <b>964</b><br>906<br>222<br>183<br>125<br>39<br>14<br>66<br><b>174</b> | 7<br>19<br>4<br>17<br>29<br>20<br>22<br>21 | <sup>#</sup> *8<br>14<br>"4<br>"8 |

"The above figures show a rapid decline from 1880-81 to 1885-86 of the amount brought in, due probably to excessive and wasteful tapping in previous years. The rubber comes from the Lushai hills north and northeast of Demagiri. This is a thickly wooded and thinly peopled tract, so that it is difficult to conceive the complete destruction of all the rubber trees. but the tendency is certainly in that direction. The Ficus elastica has been introdued into the Sitaphahar reserves and promises well. Price per maund at Demagiri R40. It is thence exported to Calcutta."

III. MADRAS.—The Conservator of Forests, Southern Circle, reports that Ficus elastica has been introduced into Malabar from Assam, and several thousand trees have been raised. "There is also a good stock of healthy young plants coming on and a well supplied nursery besides. The experiment has been successful, proving that the tree can b" grown in Malabar.'

IV. BOMBAY.—The Conservator of Forests, Southern Circle, thinks this fig would grow well in some parts of Bombay : it thrives in gardens at Belgaum.

**V. BURMA.—Mr. Strettell** (*Narrative of my Journey in Search of Ficus* elastica in Burma Proper, pages 9 to 12) quotes a report by Mr. Hough regarding the Prome plantations of the India-rubber tree. The plants came from Bhamo in 1872; twenty-three plants in all, of which six were sent to Rangoon for the Division. No further information is available as to the success or otherwise of this experimental cultivation in Lower Burma of Ficus The following communication has been obtained, however, from elastica. in the Mogaung district of Upper Burma. The collection of the rubber was till lately in the hands of a monopolist who paid Government R 1,00,000 a year, but the collection is now open to all. About 100,716 viss of rubber appear to have been collected last year. A very fair quantity is also collected in the Upper Chindwin district. There is another Ficus in the Mogaung district which the natives say gives just as good rubber as the Ficus elastica. This appears to be the Ficus laccifera. There are no Indiarubber plantations of any importance in Burma. Foreign rubber-yielding trees have been grown in gardens in the Mergui district with fair success the Hevea,  $Parn_t$  and Castilloa have succeeded best. Parameria glandulifera grows in the Mergui and Tovoy districts, but the cost of collecting the rubber is too great ever to make the growing of it a paying speculation. There is another rubber creeper in these two districts called the *Talaing* Sok, but this also is too costly to collect."

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Madras. 65

Bombay. 66

Burma, 67

BURMA

RUBBER.

Indigenous Caoutchouc-yielding Plants.

The following passages appeared in *The Times* (1888) regarding Burmese Rubber :--- Mr. Warry, of the British Consular service in China, who is at present stationed as political officer at Bhamo, has made a report to the Chief Commissioner on the India-rubber trade of the Mogaung District. Rubber was first exported from Upper Burma in 1870; and until 1873 <sup>th</sup> trade was free to all. Since the latter year, however, the forests have been worked under the monopoly system, five Chinese firms being the joint concessionaires, two supplying the money, and three superintending the work. The price ranged from R60,000 to R00,000 per annum, but in the present year the sale of the right produced a lakh of rupees. The f<\*ests occupy an extensive Kachin district north of Mogaung and stretching east across the Chinese border. The Kachins are exceedingly jealous of interference with their trees, and although at first they made the r<sup>m</sup>S<sup>take</sup> of overbleeding them, they are more careful now, and though the trees seen by Mr. Warry were covered with innumerable small incisions even up to the tiny topmost branches, they were obviously not drained to the extent 01 half their power.\* Mogaung is the head-quarters of the trade; four-fifths 01 the yearly supply is brought in there by Kachins in the employ of Chinese, the remaining fifth is purchased in the districts by Chinese agents of the lessees. The practice is for the Chinese manager in Mogaung to make liberal advances to the Kachins to defray expenses during the collecting season; when the rubber is brought in, the refund is made by selling the rubber to the manager at half the market price. Formerly the Kachins were cheated in the weighing, and they retaliated by passing off Indiarubber balls the insides of which were mostly stones and dirt. The travelling Chinese agents who also collect rubber merely travel from place to place buying such quantities as the Kachins offer, but as the latter have no standard weights they are usually cheated to the extent of about 70 per cent. The profit on this difference of weight more than pays the expenses 01 the agents. In most cases rubber is the subject of certain transit charges through the Kachin districts, the Tsawbas, or local chieftains, levying a certain tax—perhaps two or three balls out of a hundred. So long as these charges do not amount to 10 per cent, there is no complaint; they sometimes exceed this and then the Chinese protest usually with success. An ex-chief of Mogaung who is now a fugitive was of great service in arranging disputes of this nature, and now a regular expenditure in presents to the chiefs is necessary in order to keep the amount of the tran-sit dues at a reasonable level. Whatever the toll, the Chinese manager and Kachin owner bear the loss in equal shares, but the latter is amply compensated by being housed and fed at the expense of the Chinese during his stay in Mogaung. Last year a new district was opened, and a Chinese capitalist employed 400 Chinese and Shan labourers to work the forests in the neighbourhood of the amber mines. The local Kachins objected to the inroad and insisted on their right to the forest. A compromise was reached, 200 of the labourers being sent back at once, the remainder collecting rubber under Kachin supervision, to whom 10 perjcent. was to be paid, and 200 Kachins paid at the current rate took the places of the 20b dismissed coolies.'

YIELD. 08

EFFECTS OF CULTIVATION WITH REFERENCE TO YIELD.

In the remarks below regarding the yield of rubber from the introduced trees, Mr. Lawson, Government Botanist, Madras (supported by other writers), says that he cannot believe the yielding powers of the Cearas could have decreased on account of their having been transplanted from Brazil to Southern India. "At any rate,\*\* he remarks, "I can give no scientific

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• Con/, with the remarks at page 356.

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Ficus elastica—Effects of Cultivation. (G. Watt.) INDIA-RUBBER.

reason for believing that such is the case." A few jottings may be here given which have a bearing on this subject. Dr. Heifer in experimenting YIELD. with the wild caoutchouc-yielding plants of Assam found that Ficus reli-giosa produced a different kind of rubber, and in varying proportions according to position and nature of soil. On elevated ground it yielded a very coarse substance without value : growing close to water it afforded a reddish fluid which remained unaltered for several days (Trans. Agri.-Hort. Soc. Inala, Vol. V., 40). So also Mr. G. Mann (Report on the Caoutchouc Tree in the Darrang District, Assam) says : " As the distance from the hills increases, and the atmosphere in which the tree grows, gets drier, the quantity of rubber to be obtained from a tree decreases; and whilst it is stated by the men who fetch it from the hills, that one tree is able to produce from 2 to f maunds, the men who gather it from the forests at the foot of the hills only get from 20 to 30 seers per tree, and if far away from the hills, only half that quantity is obtained, especially if the ground is gravelly or otherwise severely drained " (Journ. Agri.-Rort\* Soc. (New Series), /., 73). Again in the Proceedings of the A gri.-Horticultural Society of India (Vol. V., New Series, Hi) information is given regarding the yield of rubber from Ficus elastica in Furreedpore, the Collector being so encouraged by the result as to have commenced planting the tree on road-sides. In the Kew Report for 1875 this action, in the light thrown on it by the passage given above from Mr. Mann's report, is thus commented on :----'' It is found that although the Ficus elastica will grow with undiminished rapidity and luxuriance in situations remote from the hills, it fails to yield caoutchouc. Mr. Mann concludes that no greater mistake could be made than to start plantations of Ficus elastica in any part of Bengal. It appears, therefore, judging from this case, that conditions which may ensure the successful growth of caoutchouc-yielding trees may not be sufficient to determine their producing caoutchouc." Although this may be discouraging to planters who, daily looking upon their healthy plantations of Para and Ceara rubber trees, await the discovery of some successful mode of tapping them, it is feared the doubt implied by the above facts has to be reiterated. The defect complained of may be a permanent one, namely, that while the trees will grow freely enough, they may not form their milky sap in sufficient abundance or they may produce a sap containing ingredients that prove detrimental to the rubber extraction, or a sap so deficient in caoutchouc grains as to make cultivation in India unprofitable. Mr. Thomas T. P. Bruce Warren *{Planters\* Gazette*)haiS asked the question whether Para rubber trees, acclimatised in tropical countries, produce free ammonia in their milk. The only rubber milk, he says, which he has examined that contains a large amount of ammonia, is the Syphonia elastica grown in Para. As the soil contains comparatively little nitrogenous matter, he suggests an explanation of this nitrogenous sap in the diffused lightning that occurs within the basin of the Para river. If tropical countries, where the tree is acclimatised, do not have such a meteorological condition, he further suggests that nitrogenous manuring should be tried. In this connection area a remark in the *Kew Bulletin* (1888, p. 259) regarding the West Coast of Africa as a future field of rubber cultivation may be quoted :-" In a locality so favourable for the growth of India-rubber producing plants, it would be interesting to know whether any of the plants yielding good descriptions of rubber could be acclimatised successfully without invalidating the product.\*' In the French Bulletin of Agriculture (Dec. 1888) M. Naudin gives much useful information, but regarding Ficus elastica he remarks that although the tree thrives admirably for landscape and ornamental purposes at Algiers, it does not form its milk in such abundance as to make it a profitable source of rubber,

| BBER. Indigenous Caoutchouc-yielding Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| In the account given below of the rubber of Ficus Vogelii a power,<br>ful <b>argument</b> is advanced <b>regarding the composition of the</b> milk<br>caoutchouc-yielding plants. The necessity for more chemical analys<br>has been urged (at page 340) and it need only be here added that a<br>important service would be rendered by the chemist furnishing an analy<br>of the fresh milk of each and every rubber-yielding tree. A <sup>com</sup> P <sup>a</sup> F <sup>r</sup> % <sup>n</sup><br>of these results with those obtained by the analysis of the same milks tr-<br>the acclimatised stock would save needless expenditure in forcing cultiva-<br>tion, if adverse departures were found, and the chemist would at the sa be<br>time afford the data on which a rational system of coagulation might be<br>framed. ( <i>Conf.</i> with the remarks regarding the variability of both Hermp,<br>Vol. II., 110, 118, and Flax, Vol. V, in their production of fibre, accu-<br>under different climatic conditions.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul> <li>7. Ficus infectoria, Roxb.; Diet. Econ. Prod., III., 355-<br/>Little more can be said regarding this species than will be f<sup>ouna</sup></li> <li>Vol. III., 355, of this work. A writer in the Tropical Agriculturist, voi&gt;. ^<br/>L, 121, mentions it as affording caoutchouc.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8. F. laccifera, <i>Roxb.</i> ; a synonym for F. altissima, <i>Bl.</i> ; <i>Diet. Econ.</i><br><i>Prod.</i> , <i>III.</i> , <i>342.</i><br>Nothing further need be said of this plant than will be found in. In this third volume of this work, where the opinions of several writers are given regarding its rubber. ( <i>Conf.</i> also with <i>KurB</i> , <i>For. FL Burm.</i> , <i>H.</i> » 44 <sup>2</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <ul> <li>9. F. obtusifolia, Roxb. j Diet. Econ. Prod., III., 356. ,ah<br/>Vern.—Krapchi, MICHIJ Date, MAGHJ Ngaungyat, SHM*} Nyoung*y»r&gt;<br/>BURM. «« at<br/>Habitat.—A small-leaved, epiphytic large tree of the tropical forests it-<br/>the base of the Eastern Himalaya from Sikkim to Manipur, Assam, ^TM<br/>tagong, and Burma. above) jg<br/>Cao¥tchouc—This tree (and less frequently species No. 8 Burma.<br/>alluded to by Strettell, as affording part of the caoutchouc of<br/>(Conf. also with Kure, For. Fl. Burm., II., 443.)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9«. F. Vogelii, <i>Miq.</i><br>A West African tree, supposed to be the source of the <sup>sCM:an_e</sup><br>Abba rubber that is being experimentally introduced into commethe<br>from Badagry. A sample of this rubber was recently examined by-,<br>India-rubber, Gutta-percha and Telegraph Company at Silverton. "Int<br>report will be found in the Kew Bulletin for 1888, pages 253 -261. iffe-<br>report is of special interest to India, since the properties of the rubbers af-<br>rived from the genus Ficus will most probably be found to be more near y<br>allied to each other than to the rubbers of the other plants resorted to <sup>a</sup><br>sources of the commercial article. Interest may also be viewed as existing<br>in the fact that it seems probable plantations of this Fig will <sup>s0</sup> on VI,<br>started. In the report on the samples of Abba rubber it is stated trai<br>"The sap of a tree may contain a large quantity of caoutchouc, but the<br>same may be associated with other principles contained in the sanie or<br>o-her plant tis-ues, which completely modify its character." Ag&m the<br>author of the report remarks:—"I am not aware of any native India-<br>rubber with an acid re-action; even the juice or the Para-rubber tree,<br>Hevea brasiliensis, is distinctly alkaline when drawn, and exudes a strong<br>smell of ammonia. The rubber from this source is strongly acid. In roast-<br>ing the nuts of the Urucari palms, a large quantity of acetic acid is given<br>off, which probably, by neutralising the ammonia, brings about the coagu-<br>lation of the caoutchouc; the excess of acid from the roasting of the nuts may<br>help to explain the acid re-action of the Para rubber, but as the negrohead<br>variety is obtained from the same source, and is <i>not</i> smoked although it is |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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| tion, at least in a very great measure. The samples obtained from the<br>'Abba' tree are not acid, but whether the product could be improved by<br>precipitation with ordinary crude acetic acid which at the same time would<br>arrest those changes that are liable to go on afterwards, to the detriment,<br>probably, of the rubber, is worth finding out."<br>The suggestion here offered would seem of much value to India.<br>Assam rubber is often complained of as undergoing injurious changes<br>even in the prepared state. It is difficult to dry, and remains adhesive<br>for a long time instead of becoming perfectly dry, like Para rubber. It<br>would seem therefore that before the home markets are prejudiced against<br>Assam rubber and a price comes to be affixed to it which may be below<br>its real value, the chemistry of the milk and of the rubber should be worked<br>out with the view to discovering whether the defects complained of are due<br>to other than caoutchouc ingredients in the milk which some process of<br>coagulation and washing might overcome. | SECOND BEST<br>RUBBER<br>of<br>BURMA. |
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| <ol> <li>Parameria glandulifera, Bth.: APOCYNACEJE.</li> <li>References.—FL Br. Ind., III., 660; Kure, For. FL, II., 189; Wight, Ic,<br/>t» 1307; Kew Report for iS8rg 47—48/ Official Correspondence between<br/>Govt. of India and the Govts. of Assam, Burma, Madras, Coorg, &amp;c.f<br/>from §881 to 18*4; Mr, Pierre's account of this creeper in Cochin-China<br/>and Correspondence thereon, see Tropical Agriculturist, II., 79, 158; ///.,<br/>1*5, 6&amp;7; IV., 86, 159.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 73                                    |
| Habitat.—An extensive climber found on the trees of the tidal forests of Martaban, Malacca, Singapore, and the Andaman Islands, but by mistake spoken of (in <i>the Kew Report</i> ) as abundant in Southern India. The above quoted official correspondence, from this mistake of habitat, resulted in many futile attempts to find the plant in India proper. It has been experimentally cultivated in Burma, but interest in the climber appeals to nave died out.<br>% Caoutchouc.—Rubber of excellent quality was said to have been ob-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |
| tained from this creeper.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |
| <ul> <li>{Con/, with the concluding remarks under Urceola.)</li> <li>W. Urceola elastica, Roxb.; APOCYNACEJE.</li> <li>References.—FL Br. Ind., III., 657; Sir D. Brandt<sup>s</sup>, Review of Mr. Collins'<br/>Report; Kure, For. Fl. Burm., II., 162,' Indian Forester, VII., 241;<br/>AgriHort. Soc. Journ. {Old Series}, VIII., 104; Kew Report, 1880, 45.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 74                                    |
| HabitatA climbing shrub met with in Malacca and Penang; dis-<br>tributed to Sumatra.<br>This is reported by some writers to yield part of the Borneo rubber,<br>but according to the <i>Kew Report (1880, p. 45)</i> the North-West Borneo<br>rubber is the produce of Willughbeia Treacheri and probably therefore<br>Howison's discovery of rubber in Asia in 1799 was the rubber of Wil-<br>lughbeia, not of Urceola.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |
| 12. U. esculenta, <i>Benth</i> .<br>'Syn.—CHAVANNESIA ESCULENTA, <i>A.DC</i> .<br>Vern.— <i>Kyet-poung-hpo</i> , BURM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | · 75                                  |
| References.—FL Br. Ind., III., 658; Strettell, Note on Caoutchouc {Ran-<br>goon, 1874) / Tropical Agriculturist, II., 79? Kure, For. FL Burm., II<br>162, 184; Kew Report, 1877* P- 3i; Indian Forester, /., 186—190 {rebub<br>UshesStrettelVs Paper), VII. <sub>%</sub> 241; AgriHort. Soc. Journ. {Old Series}<br>Vol. X., (Proc.) 125—126.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |
| Habitat.—A troublesome climber, which, after Ficus elastia, is said to<br>yield the best India-rubber. It is found in Martaban and Tavoy; and is<br>common all over Pegu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | I                                     |

# Parameria and Urceola Rubbers (G. Watt.) INDIA-RUBBER.

1.75

Indigenous Caoutchouc-yielding Plants.

Caoutchouc. I. BURMA.—A sample of very superior rubber obtained CAOUTCHOUC from a plant which Dr. Thomson thought might be the above was 1458 Burma. cured from Rangoon by the Agri.-Horticultural Society of India "finantia" It was furnished by Captain E. H. Power, and the report on Karates 76 that it was free from that stickiness which characterises and deienv the India-rubber obtained from Assam. rilbber Dr. Mason (Burma and Its People, 523) describes a superior Echies derived from a creeper which the Rev. Mr. Parish thought might of -- have "With care in preparation, it would be equal to the best South A."I uprect In 1874 fresh and more pointed attention was directed to this s jHe by the publication of Mr. Q. W. Strettell's pamphlet on the creepeIT...g ^ tells us that his attention was first directed to the subject <sup>by</sup>. <sup>ob</sup>f<sup>e</sup>\_Ls of Kachyen girl dyeing thread an indigo blue by means of the leath ^ Strobilanthes flaccidifolius (the *rum*, indigo of Assam and Burma)  $w_{1}^{*}$  and  $w_{1}^{*}$  equal quantity of the leaves of Urceola esculenta. This fact has a c mil interest since the allied plant Wrightia tinctoria and several other giving plants, such as Marsdenia tinctoria and Gymnema ting<sup>en</sup> ${}^{2}J_{aveS}$  known to afford indigo. It is thus highly probable that the  ${}^{1}$   ${}^{4}$ of Urceola esculenta contain indigo, and that the combination Strobilanthes serves a direct tinctorial purpose and is not a.  $m_{as}^{ere}$  wijj junct. If this be so, it is probable that Urceola might afford  $m_{as}^{in}$  &  $2J_{0}$  the as rubber. But Mr. Strettell being then engaged on an enquiry "Lerty source of Burmese rubber, was naturally more interested in that points of the plant. He collected a sample of the rubber, submitted highly Messrs. Galbraith, Dalziel & 90., and obtained a report of a 1  $^{\circ}$  encouraging nature. "We consider the quality to be very \*aixs... ^ the present market value of about R200 per 100 viss." Stimulated by the prospect held out Mr. Strettell went into the question of water hlenv mately correct, and assuming the trees to be 30 feet apart, the folio details will enable us to form a fair idea of the probable financial r e u ^ Area'to be cultivated 400 acres. Trees at 30 feet by 30 feet, equal acre to 48, or 19,200 creepers in 400 acres. Minimum yield of caoutchouc per annum, estimated at one viss per creeper, enual 19,200 viss, or at R200 per 100 viss, 1\*38,400 per annum/ The cost of Starting this project will on trifling in the extreme. All that will be necessary ought not to exoeed, on an average of seven years, R4. per acre per annum. After the first year the creepers will have attained a sufficient height to require little. or no further ottention beyond of accurate first for the first year further attention, beyond, of course, protection from fire. Thus, at the of seven years, the cost on 400 acres would represent R 11,200; ^5<sup>+</sup> e<sup>ven</sup> this expenditure might be reduced if Shans or others were induced to s en their labour for the privilege of cultivating within the area free of ta m Awhile a still further reduction might be brought about by intermedia while a suil luriner reduction might be brought about by intermediated sowing, tapping each alternate creeper to death immediately it commenced to interfere with its neighbour. At the expiration of seven years the ex-penses will embrace tapping, pressing, and preparing the caoutchouc, which I estimate at 124 per cent, of the profits. According to these figures and the present market value of the India-rubber of this creeper, the net assets of this scheme may be approximated at R33,600 per annum. Mr. Strettell affirms that the milk of the creeper more readily coagu-

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Urceola and Borneo Rubbers. (G. Watt.)

jates than that of Ficus elastics, "for I have known it," he says, "resolved into a coagulum floating in an aqueous solution within a few hours after collecting, and without exposure to the direct rays of the sun, or artificial heat of any kind. This consolidated mass should be collected at once, and all moisture expelled by means of graduated pressure." The season for tapping, Mr. Strettell recommends, is from the end of April: from October to March, he says, the circulation is slow and the milk scarce. Mr. Strettell's pamphlet concludes with the statement that Messrs. Galbraith, Dalziel & Co. report that the rubber he has furnished them with is superior to that from the India-rubber tree, being purer and better suited to their purposes.

This species of rubber-yielding plant is cultivated to some extent in Burma on accovit of its fruit which finds a market as a substitute for tamarinds: if to this fact it were found that the leaves also had a value, additional arguments might be advanced in favour of an experimental cultivation of this creeper to those used by Mr. Strettell. At all events no action seems to have taken place and the subject has once more lapsed into the oblivion into which it fell, after the appearance of the reports (quoted above) which were published nearly a quarter of a century before the date of Mr. Strettell's paper. This is the more to be regretted since Landolphia and other foreign climbers and trees have received every attention, and money has been spent in their acclimatisation which might more profitably have been used in dispelling the uncertainty that still exists regarding Urceola elastica. The force of this recommendation will be apparent when it is added that Mr. Strettell affirms that an annual budget provision is made to exterminate this most destructive and persistent climber from the teak forests. It is thus probable that a considerable amount of rubber, which might even be collected from the wild stock, is being wasted. Without, therefore, corroborating, in any way, Mr Strettell<sup>5</sup>s statement of yield or his estimates of profit (which of course the writer has no means of doing), it would seem highly desirable that this subject should once more receive the consideration it seems to deserve, so that the public may be saved from other spasmodic reports in the future by the publishing of results either in support or in refutation of Mr. StrettelPsarguments. If this be the sok of the Talaingspeaking people, a recent report states that like the rubber from Parameria it will not pay its extraction and preparation.

II. MADRAS.—The Conservator of Forests, Southern Circle, reports that this rubber plant "has been introduced by Mr. Morgan into Malabar from Burma. The growth is very slow, the largest plant, now four years old, is only 15 feet high and 1J inches in diameter at the base. It does not promise to be of much value as a rubber-producer."

## 13. Willughbeia edulis, Roxb.; Die. Econ. Prod., I., 273-277; APOCY-

Syn.—VV. MARTABANICA, Wall.

The rubber from this and one or two **allied** species is commercially designated MALAYA or BORNEO RUBBER.

Mann.—Lati-am, BENG.; Thit kyouk nway, BURM.

References.—FL Br. Int., 111., 623; Roxb., FL Ind., Ed. C.B.C., 260;
Kurzy For. FL Burma, II., 165; Report on Pegu, App. XII.; Report, Botanic Gardens, Ceylon, 1881 (see Tropical Agriculturist, Vol. /., rotf);
Tropical Agriculturist, II., 79; III., 81; V., 767; Indian Forester, III., 240, 242; VIII., 202; Drury, Useful Plants 0/India, 445; Kew Refiort. 1879, 18; 1880, 3S, 43,44>4S.

Habitat.—An immense climber met with in Assam, Sylhet, Cachar, Chittagong, Pegu, Martaban, Malacca, and Borneo. Yields a large edible fruit which, apparently from an external resemblance to the mango has received its Bengali name of climbing-mango. Madras. 77

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(G. Watt.) INDIA-RUBBER.

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WILLUGH-

BEIA RUBBER.

fNACEA.

| Concetton of<br>81<br>Concetton of | INDIA-RU                       | JBBER.                                                                                                                                                                                                                                                                                                                                                                                                                         | Introduced Caoutchouc-yielding Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| conection of<br>81<br>S1<br>S1<br>S1<br>S1<br>S1<br>S1<br>S1<br>S1<br>S1<br>S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INTRODUCED<br>CAOUTOHOUC.<br>T | ike .r<br>rube<br>wounded<br>by expos<br>rubber.<br>speaks o<br>ing thro<br>no-great<br>yields the<br>(B). INTRO<br>14. C                                                                                                                                                                                                                                                                                                      | ber of this climber. Every part of the plant, he writes, on being<br>d, discharges copiously a very pure white viscid juice which is soon,<br>sure to the open air, changed into an indifferent kind of elastic<br>Tnmen in his report of the Ceylon Botanic Gardens for 1881<br>of W. zeylaaica, <i>Thw.</i> , as yielding a caoutchouc which after pass-<br>ugh a viscous sticky condition dries into a putty-like substance of<br>t tenacity and scarcely any elasticity. W. Burbidgei'of Singapore<br>e rubber known in commerce as Gutta-singgarip.<br>ODUCED CAOUTCHOUC-YIELDING PLANTS. (For A. see page 342)<br>Castilloa elastica, <i>Cerv.</i> ; <i>Die. Econ. Prod</i> , <i>II.</i> , 229; URTICACE^.<br>THE CENTRAL AMERICAN RUBBER TREE, known afeo as NI-<br>CARAGUA RUBBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| "It the close of the day the rubber-gatherer collects all the milk, washes<br>it by means of water, and leaves it standing till the next morning. He<br>now procures a quantity of the stem of the moon-plant (Calonictyon<br>After this diction L <sup>int</sup> K <sup>0a mass</sup> >. <sup>and</sup> throws it into a bucket of water,<br>in the proportion of 'b L <sup>be <math>\wedge</math> straine &lt;*, it is added to the rubber milk,<br/>the whole of the milk <math>11^{mt}</math> l? af<sup>allon, or until</sup> * <sup>A</sup>er brisk stirring,<br/>on the surface ar now sTr K <math>\wedge</math> Tu<sup>he</sup> masses of rubber floating<br/>I. <b>81</b></sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                | of the se<br>remark a<br>vided the<br>tree and<br>Tvest T<br>u may be<br>that on tr<br>the young<br>is abun ^<br>A ^ S ^ nth L<br>the tre ^s<br>the SCO<br>and the m<br>or chant<br>apart a^I<br>gua the tr<br>L HI ^ I<br>The milk i<br>is tapped a<br>down X<br>L years,<br>tapi on<br>Mr. D.<br>di Cribes t<br>" It the ch<br>it by mean<br>now procu<br>speciosum,<br>After this o<br>in the pro<br>the whole<br>on the st | The propagated by seeds or cuttings, and Mr. Gross recommends<br>analytic wait the lowest leaf be buried in the soil. In this way<br>grants a height of 160 to 200 feet with a girth of 12 to 15 feet.<br>Syears old were observed to have obtained the height of 23 feet,<br>e propagated by seeds or cuttings, and Mr. Gross recommends<br>analytic the lowest leaf be buried in the soil. In this way<br>grants make better progress.<br>n^nff10 <sup>F MILK</sup> : T <sup>Dr</sup> - Primer, writes on this subject:-" Milk<br>$D^{0\pi AtA}$ but * is of a somewhat more watery. con-<br>^? sthe ft $D^{P}$ Pa J <sup>a</sup> TM <sup>b</sup> ber- In consequence of the large size of<br>it is the practice of the collectors in Panama and other parts to<br>www. A grower or ring is first cut round the base of the trumk<br>flk received into larg 2 leaves. The tree is then felled, rings<br>the rubber allowed to run into leaves or vessels. In Nicara-<br>rees are tapped with sharp axes in various ways, so much injury<br>flat the process is repeated only at intervals of three years.<br>s rec_ived into jarg 2 leaves. The tree is then felled, rings<br>the rubber allowed to run into leaves or vessels. In Nicara-<br>rees are tapped with sharp axes in various ways, so much injury<br>flat the process is repeated only at intervals of three years.<br>s rec_ived into jarg 16 or 18 inches." A writer in the <i>Tro-<br/></i> |

### Central American Rubber.

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and placed under heavy weights to get rid of all watery particles. When perfectly drained and dry the rubber cakes are fit for the market, and exported generally in casks." Alum is sometimes used in place of the

portectly drained and dry the rubber cakes are fit for the market, and exported generally in casks." Alum is sometimes used in place of the moon-plant, or the milk is freely washed in water and slowly pressed. This process of preparing by means of water was described by Mr. Cross, the milk after washing being left to dry in vats. Mr. Niellson in a report on Abba rubber of the West Coast of Africa, states that in his experience of Castilloa •rubber in British Honduras, one gallon of milk yielded 3ft of rubber.

## CULTIVATION OP CASTILLOA RUBBER IN INDIA.

I. BENGAL.—In his annual report of the Botanic Gardens for 1881-82 Dr. King wrote that of this rubber tree he had up to that date only eight plants, *but* added it was being propagated as fast as possible. Other reports followed, but apparently no material progress was made in the acclimatization of this rubber.

II. MADRAS.—In the report of the Botanic Gardens, Nilghiri hills, for 1881-82, Mr. Jamieson reported receipt of the first plants. Two healthy young Castilloas were then obtained from Ceylon, Mr. Jamieson remarking regarding them :—" The reason I value these plants so much is that I have had to wait for them so long, having been led to expect a supply of Castilloa plants so far back as 1878. Shortly after receipt of the plants I took off a few cuttings, which rooted in less than a month. Since then every available cutting has been successfully propagated, and our stock now consists of fourteen healthy plants, including the two from Ceylon. The cuttings require constant care and close personal supervision for the first few days, being liable to damp off by the slightest excess of moisture. It, however, seems a strong growing plant when once rooted. The only drawback we have had to contend with in growing the Castilloa under glass is to keep it free from the attacks of the red spider, which, if allowed to get hold of the plants, would considerably retard their growth. One of the Ceylon plants has been put out in the Barliyar gardens, where I hope it will thrive, as in these days of uncertain coffee crops, and low prices, planters are anxious to cultivate any plant that will return a small interest on their outlay. It is therefore of the utmost importance that every effort should be made to propagate this plant for distribution. I have no doubt many localities in Wynaad and on the slopes of the hills will be found to suit the Castilloa and where it will yield a profitable return to the cultivator."

The Conservator of Forests, Southern Circle, reports that the trees in Nilambúr " are far too young to produce any quantity of rubber." In a recent report (1888) by Mr. M. A. Law son, on the present condition of the introduced rubber trees of South India, the following passage occurs regarding- this species :—" With respect to the Castilloa, there are in the Barliyár Gardens some five or six trees of about twenty feet in height, and with stems of about two feet in circumference. These plants flowered and seeded for the first time last year, and the seed germinated freely. They look as healthy as possible, and grow with great rapidity. Besides these *Jfees* at Barliyár, there are a few in the Teak Plantations at Nilambúr, and Mr. Ferguson has several in his garden near Calicut. They are easily propagated from cuttings, and could be, by this means, increased indefinitely, but the same difficulty has been experienced in extracting rubber from them as has occurred in the case of the Cearas."

15. Hevea brasiliensis, Mull. Arg.

THK PARA RUBBBR TREE.

"teeferences— Tropical Agriculturist, Vols. I., 7P, 665, W48 / //., 75, 682, <sub>9</sub>Z7f III., 21,109, 326,851 i IV., S28, 689, 690; V., 660, 824; VIII., 135,

Madras.

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Bengal.

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PARA RUBBER. **84** 

(G. Watt.) INDIA-RUBBER.

#### Introduced Caoutchouc-yielding Plants\*

**693;** Indian Forester, IV., 42, & t VI., 150, 187, 232; VII., 244 i **VIII.** 58, 62; XIII., 285; JCew Report, 1879, 19; r88r, if; 1882, **40-4**' | **Report** on Govt. Botanic Garden\* & Park, Nilghiri Hills, i88r-82; **\* Report** Botanic Gardens, Calcutta, 1875-76, 2; 1877-/8,2; 1878-79\$ '/ Andaman Islands, 1X85-86, 53. PARA RUBBER. Habitat.—This and one or two allied trees occur in the forest ot ^ emit\_ and Northern Brazil and in the forest of Para from the mouths of w Amazons, south and west. The region thus indicated has a cuma^B the markable for its uniformity of temperature, the mean being 8» r. ana greatest heat 95° F. (Plantations should not therefore be made in a regi where the temperature at any time falls below 60° F.) The rainfall occur h principally in January to June, the maximum being in April, where the region as having a  $de_A p^{e_A}$ soil, large tracts being flooded in the wet season and in the/jry <sup>A</sup> c ls completely intersected with water-courses. The most productive 1 -nd arc at most only 80 to 100 feet high, the soil full of moisture, ncn » fertile, but the atmosphere very unhealthy. The tree grows rapidly, attaining some thirty feet in three  $\frac{v e a rs}{t}$  A readily propagated by cuttings. Mr. Cross recommends plantations to made in seasons of inundation or flood, the cuttings being forced into to mud for half their length, leaving enough above ground to save the from being actually submerged. Propagation by seed is not so successi **REGIONS MOST LIKELY TO PROVE SUITABLE FOR THE PARA RUBBBR** Suitable Regions. TREE. The following extract from Sir D. Brandts' review of  $W^{r_w} \stackrel{\circ}{\longrightarrow} ?$  and report gives the tracts of India which Sir D. Brandis  $antiaP. \stackrel{\circ}{\longrightarrow} m_{O}$  at which all subsequent experience (since 1873) has confirmed, as being  $h_{raz}$  suited to Para rubber. Having compared the extremes of  $5^{iimat}f_{raz}h_{raz}$ 85 also the means, on the west coast of India and in Burma, with that ot » he rer.iarks: «'We may, therefore, conclude that Kanara, Malabar, 1<sup>14</sup> vancorc, and the Burma coast, from Moulmcin southwards, offer the ae sired conditions as regards temperature, for the successful cultivation of the caoutchouc-yielding species of Hevea. I would specially draw the auth tion of forest officers in this respect to the moist, evergreen forests a foot of the Coorg Ghdts, and in Kdnara, as well as to the Attaran vaney, and similar localities in Tcnasserim." - ₁t., Collection of Rubber.—Mr. Cross gives a detailed account of we method pursued at Para, of which the following are the main facts. Collection. milk is drained into small earthen vessels attached to the trees by » adhesive clay. The contents of fifteen of these cups make one  $?^{h}?''rJ$  imperial pint. "Arriving at a tree, the collector takes the axe in his ngn hand, and, striking in an upward direction as high as he can reach, <sup>rna</sup>J\*<sup>c\*</sup>, <sup>a</sup> deep upward sloping cut across the trunk, which always goes througn 1 bark and penetrates an inch or more into the wood. The cut is an me in breadth." Frequently a small portion of bark breaks of! from <sup>tn</sup>£.<sup>u</sup>Pt<sup>fr</sup><sub>v</sub> side, and occasionally a thin splinter of wood is also raised. QuiCKiy stoppingdlown he takes a cup, and pasting on a small quantity \*\*Cr ^ Or the fat side, presses itot ehrun c deel enclath the cut By this time the milk, which is of a dazzling whiteness, is beginning to exude, so that if requisite he so smooths the clay that it may trickle direct into the<sup>cu</sup> p a distance of four or five inches, but at the same height, another cup, is luted on, and so the process is continued until a row of cups encircle the tree at a height of about six feet from the ground. Tree after tree is treated in like manner, until the tapping required for the day is finished. This work should be concluded by nine or ten o'clock in tJic morning, because the milk continues to exude slowly from the cuts for three hours or perhaps I. 86

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#### Pant Rubber.

(G. Watt.) INDIA-RUBBER.

longer." . . The quantity of milk that flows from each cut vanes, but if it is large and has not been much tapped, the major ty of the cups will be more than half full, or occasionally a few may be filed to the brim. But if the tree is much gnarled from tapping, whether it growsj" the rich !ludge of the ^ o' or dry land, many of the cups will be found to contaironly about 1 tablespdbnful of mifk, and sometimes hardly that. On the following morning the operation is performed in the  $^{me}$  way, on  $\stackrel{b}{\succ}$  that the cuts or gashes beneath which the cups are placed are made from six to eight inches lower down the trunks than those off the previous das. Thus each day brings the cups gradually lower until the pound is reached. The collector then begins as\*high as he can reach, and descends as tefore, taking care, howeverfto makers cuts in separate places from those pre. viously made. If the yield of milk from a tree is great, ^ o j o ws of cups are put<sup>n</sup> at once, the one as high as can be reached, and the other at the surfaceof the ground, and in the course of working, the upper row descending daily six or e&ht inches, while the lower one ascends the same distance, both rows in a few days come together. When the produce of milk diminishes in long wrought trees, two or three cups arc put on various partsi of the trunk, wW the bark is thickest. Although many of the trees of this class are large, the quantity of milk obtained is surprisingly little. This state of things is not the result of overlapping, as some have suggested. . . The best m:lk-yielding tree I examined had the marks of twelve rows of cups which had already been put on this season. The rows were only six inches apart, and in each row there were six cups, so that the total number of wood cuts within the space of three months amounted to sevent>-uo. There are other methods occasionally pursued, but the cup process is the most general and gives the best result. Dr. Tr.men afds to the above account that the trees are tapped if they have a arcumference of 18 to 24 inches, and the rough process described is carried on for many >ears, until the constant and extensive injury to the young wood causes f^ deathfor some years previous to which event they almost cease to yield milk and are practically abandoned. A writer in the Tropical Agriculturist hxes Tine the aget)f 25 years as that at which tapping should commence, actual yield of a tree per annum and for each year of its life, does not ap-Pear to have been worked out by Mr. Cross, but assuming 7\* cuts to bca high average, and that each cut yields half a cup full (also from Mr. Cross's statements a very high average) about six imperial pints of milk would De obtained from a tree in good bearing condition. Mr. Cross is careful to Point out, that although the trees are large, the yield is surprisingly little, and it would thus seem probable that the Para rubber may be remunerative at present prices, when dealing with wild plants in their indigenous habitat, but might not be so if expensive cultivation and supervision were necessary.

#### CULTIVATION OF PARA RUBBER IN INDIA.

HISTORY OY INTRODUCTION INTO ASIA.-In a letter dated April 1878, Mr. W. T. Thiselton Dyer gives the history of the attempt to introduce Hevea fc?aziliensis into India and Ceylon. On the 4th of June 18731.the Director of Kew Gardens received from Mr. Markham some hundreds of seeds which had been collected by Mr. James Collins. Of these less than a dozen germinated, and six were in that year taken out by Dr. King to Calcutta. These did not succeed well in Calcutta, and it was accordingly arranged that Ceylon should be established as the depot for supplying young plants to the parts of India where Hevea cultivation was thought possible. On June 14th, 1876,70,000 seeds were received at Kew from Mr. Wickham (who was paid for them at the rate ol £10 per i.000); 4 per cent, germinated. Of these, 1,919 plants were sent to Ceylon in 38

CULTIVA-TION. Introduction. **87** 

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HEVEA

BRASI-LIENSIS.

PARA RUBBER. Introduced Caoutchouc-yielding Plants.

Wardian cases, in charge of a gardener, and 90 per cent, reached in excellent condition. On August 23rd, 50 plants were sent to Colonel Seaton in Burma, but arrived in bad condition. A further supply of 100 plants was taken out to Ceylon from Kew by Mr. J. F. Duthie. Similar consignments were also issued from Kew, a'mounting in all to upwards of 2,000 plants sent to Ceylon, and smaller numbers to Burma, Calcutta, Mauritius, and Singapore. Mr. Dyer adds in his review of these endeavours to secure the acclimatisation of Para rubber that the plant is now therefore to be regarded as definitely established in the East Indies. So again, in Novem; ber 1876, Mr. Cross arrived at Kew with about 1,000 plants brought direct from South America, but only about 3 per cent, of these plants survivea, so that it would appear Mr. Cross's share in introducing Para rubber was a very small one.

On the subject of Para rubber introduction Dr. Trimen wete'. "The cost of procuring the seeds of Para rubber, <sup>f</sup>reight, and otnet expenses appears to have been no less than £1,505-4-2, the ^ar ^an \***n** e cases alone costing £120, and the gardener and his passage £103. ) B) whole of this large expenditure was borne by the Indian Government. the case, it is Ceylon which ' from climatic causes chiefly<sup>f</sup> appears likely of benefit most largely from the successful action of the Government ve (Tropical Agriculturist, Vol. /., 399). This view appears to na India" been so far correct, for Dr. King, in his Annual Report of the £> rub-Gardens, Calcutta, for 1881-82, wrote that the cultivation of the rara ber plant had been abandoned in Bengal. most en-

But even in Ceylon, and after some eight or ten years of the the state in thus is thus is thus in the solution, the opinion was finally army ? Tropi-Para rubber would not pay the planter to grow it. The pages of the cal Agriculturist from 18S1—86 literally teem with contributions, en(Jit and reports on Para and Coara with a state of the state of and reports on Para and Ceara rubber, with only one or two passing that Para and Ceara rubbers would not pay, and in many parts of trie  $cou^n \wedge$ try the trees have since been hewn down, being viewed as worth<sup>less</sup> he1888-89 fresh interest was, however, awakened, in consequence of favo<sup>ura</sup> reports having been furnished on samples of Cevion where cont to core. devoted to Ficus elastica. The planter's verdict ultimately was, as reports having been furnished on samples of Ceylon rubber sent to  $\& u_{mgn}^{ope}$ Dr. Trimen in his annual report for that year urges the Ceylon Governm to take the matter in hand as a State enterprise. He had tapped a tree (eie ven years old having a stem circumference of 4 feet 2J inches), during three of the off the state of the state periods of dry weather, and oLtained ift 12J oz. of dry rubber at a^cost of 62 cents. Dr. Trimen comments on this result:—" As the rubber <sup>o b t</sup>?" ed is probably worth at present prices about 45. per fl>, there is clearly a. 1 dS j profit to be made here out of a Hevea plantation. I urged the formation of such upon Government so far back as 1882, but in the absence at that 1 m of any organised Forest Department nothing could be done. As a valuable forest product, Para rubber may be confidently reckoned upon as as the source of future revenue, and I strongly recommend that large j\* antaiions of it be formed in suitable places." n &

It may thus be inferred that as a State undertaking Para rubber would likely prove as remunerative as most other trees, and it is perhaps the dur of all Governments in tropical countries to assume the responsibil. ble providing for the world's future wants in rubber by organising suit a of forests, but it may be accepted as established that such forests are n. likely to be of interest to the planter who requires to turn over his cap<sup>1\*\*</sup> in as short a period as possible. In January 1888, the Government.04 India (in consequence of a despatch from the Secretary of State in whick I. 87 attention was drawn to the fact that the Royal Botanic Gardens, Ceylon,

### Para Cultivation in Burma.

(£. Watt) INDIA-RUBBER.

PARA RUBBER. possessed a plentiful supply of the seeds of Hevea brasiliensis), issued a circular letter to Local Governments calling for a short r&sumi of the success which had attended the cultivation of that tree. The following extracts from the replies bring our knowledge of the cultivation of the Hevea rubber tree down to the most recent data :-Bengal. I. BENGAL.—" It has been ascertained from the Superintendent of the Royal Botanic Gården, Calcutta, that nearly ten years ago a quantity of the seeds of this 88 tree (one of the species from which South American India-rubber is obtained) was sent to the garden from Kew. Some of these seeds germinated, but it was found that the resulting seedlings were extremely sensitive to cold, and that the low night temperature of the cold weather of Bengal proved fatal to them, even when planted in the most sheltered situations. Some of the seedlings were supplied to Tea Planters likely to give att minor to their culture, and some were sent to Mr. Mann, the Conservator of Forests in Assam. The results obtained by these gentlemen were, however, the same as those obtained by Dr. King, and it was on his recommendation that subsequent supplies of Hevea seeds were sent to Ceylon, instead of to India. The Superintendent thinks that Hevea will grow well in Provinces like Malabar or Lower Burma, where the climate is said to be moist and equable; but in Northern India, where there provesn cccss: a Splisoli, Dru Klung is of Pinion that its cultivation is not likely to <sup><7<sup>h</sup>fu<sup>C</sup>?<sup>11</sup>servatorof For</sup>ests, Bengal, who has also been consulted on the subject, reports that it does not appear that any experiments in the culture of the tree in question have ever been undertaken by the Forest Department in this Province." Burma. II. BURMA.—Colonel W. J. Seaton wrote of Tenasserim :-" Early experiments\*-Experiments on a small scale were commenced at Mergui 89 in 1877, with eight seedlings, the survivors of a small batch received from Dr. King, of the Botanical Gardens, Calcutta. They were successfully set out in the Forest Office compound at Mergui, and although on a low hill, a not very desirable site, yet their growth was for some time satisfactory. In 1879, a large number of Hevea plants, be-lieved to be well-rooted cuttings, were forwarded by Dr. Thwaites, of \*he Royal Botanical Gardens, Ceylon, and although in the charge of a subordinate who had been sent to Ceylon for special instructions, only 178 survived the voyage. These were set out in the plantation area selected, about if miles inland from Mergui, on somewhat low ground drained by the sources of the Boke Chaung, a small tidal creek. Only 64 of the healthiest plants survived the planting operation, and of these again casualties continued to take place yearly, owing chiefly to attacks of white-ants until the number was reduced to 50 in 1886, since when there have been no further casualties. The following were the sizes of ten of the largest trees of 1879 measured on 29th March 1888:-Girth in inches No. Height in feet. at 2 feet from REMARKS. ground. 29I Forked into two branches 4 feet from ground. 1 39 2 34\* 37 Clean bole of 9 feet. 3 40 38 **Bitto** 1**8** 4 5 6 **43**\* 4∞£ Forked at 3 feet from ground. 394 **3**3\* Clean bole of 8 feet. 27\*\_ 7 8 3i 18 Ditto 10 3<>£ ,, <u>3</u>0 Ditto 6 ,, <u>9</u> **3**<sup>1</sup> 27 Ditto 6 ,, 18\* Ditto 8 10 21\* ,,

Propagation with cuttings —In the rains of 1879, 24 cuttings from the young trees in the Forest Office compound were set out in the plantation, but the experi-ment proved unsuccessful. Subsequent attempts, made from time to time, met with no better success, the cuttings generally dying off during the second year.

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# INDIA-RUBBER. Introduced Caoutchouc-vielding Plants, SEVEAr The transformation with seed. n 1884, a few of the jdei<sup>t</sup> trees jaylag commenced to seed, experiments were made, with the result that st seed lings were successfully RUBBER. raised These, however, when transplanted into the main plantation, were speedily shoots by deer. The following year a large quantity of seed was procured from the to older trees, but not being sown immediately after collection, a great portion of it To older trees, but not being sown immediately after contention, a first state, bether failed to gorminate, and only 121 seedlings were missed. In the rains of 1886, bether results were obtained by the timely sowing of the seed obtained from the older been and by the part removal of the bask enclosing the seed. As many as 7,000 seedlings were raised, germination occupying three to four days. Experiments were continued in 1887, and 3,430 additional seedlings obtained. From Ceylon 54 seeds were rotative ed in October 1887, of which only 31 were fit to sow, but all tailed to germine to Stock on hai. at end of March 1888, The stock of trees and plauts in the plantation and purseries was as follows: Trees set out in 1879 Scedlings of 1884 to 1885, act out in the main plantation 20<sup>7</sup> × 10<sup>4</sup> In the nurseries, ready for transplanting and tof 1886 2,752 distribution. -430 1 of 1887 14.04 GRAND TOTAL General remarks.—The 50 older trees appear to be in perfect health, with evi-dence of such vigour as to\_pave no doubt that they are fully established and have ou rown all danger from attacks of white-ants. They yield an abundant supply at seed, some of which, it\_illowadJtoJall,=Qee^sienatian all ^^^^fa=Ufi\_trees. The fl paper of which, it\_illowadJtoJall,=Qee^sienatian all ^^^^fa=Ufi\_trees. The and fSjSITiiS means and August about the middle of the rainy season. It me be seen that the propagation of the Hereas benefitiened to be the rainy season. It me be seen that the propagation of the Heves, brasiliensis in this part of Burma is not Other Tildepindent of external assistance, and that its archivation has been suc-cassfully demonstrated. It now only remains to subject the larger brees to periode tapping to ascertain the yield in caoutchour, after which the question will have to be determined as to the precise area which it may be advisable to plant up at Mergui tudTolTssuitable localities with this valuable tree. In a communication, dated 28th January 1889, Ogional W. J. Seaton gave the following account of the method of tapping and the yield of Pattier Ostalized SY film from the Para-rubber trees of Tenasserim :----"The tapping experiment was first undertaken in July, under the impression that the flow of milk would be more abundant during pots were in the first instance affixed to the trees by means of well-scought potter's clay, and above them small pieces of the were also placed in such a position as to pro-tect them from the rain; but, as the clay yielded to the rain and fill to the ground tapping had to be undertaken at intervals between the more, the bankour puts being affixed by sharpening the upper end and forcing them into the bankour puts over a fillow of the target in the upper end and forcing them into the bankour puts be seen that the propagation of the Heyea brasiliensis in this part of Bur Tield. 00 tapping had to be undertaken at intervals between the showers, the hambot pro-being affixed by sharpening the upper and and forcing them into the bark in the man-ner followed by the *Thitsi*' collectors. In order to obtain the largest quantity of milk in the shortest time possible, numerous incisions were made on the frees. The incisions were made in an upward direction and converging as required. The quan-tity of milk collected was so small in the intervals between the showers that it was deemed necessary to limit the experiment finally to five of the largest trees on the west bank of the Bokchaungale, which flows through the observed. The milk was found bank of the Bokchaungale, which flows through the plastation. The mile was found to flow much more freely from these the plastation. The mile was found trees first experimented on. They have, however, a thicker bark, and it was uur served that the exudation of milk was^testnearthiegrouid^^ ore the bark was thickest while at a height of six or served. served that the exudation of milk was^testnearthiegrouid^^ere the bark was thickest, while at a height of six or seven accel it was almost mill. Groups to cardinated wat weather, it was found necessary to dry the milk over a fire and keep it subsequently in a warm place near the fire for about three weeks. The experiment was renewed between and and a6th November, when the rains had fully creased, at trees being operated on, eis., 5 to the west and 37 to the east of the Bolichaungale. The me-incision being small (less in fact than was the case in the rains), the several brees werk to do it sapping was the same as that followed previously; but the yield from each incision being small (less in fact than was the case in the rains), the several brees will to to the in atmost extend, and, by constantly collecting the milk before it had to the west and 9 or. from the 37 trees to the east of the Bolichaungale." It may here be remarked that while Para was early seen to be unsuited to Bengal, and accordingly the Botanic Gardens of Ceylon were **I. GO**

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Hevea Cultivation in South India. (G. Watt.) INDIA-RUBBER-

selected as the best locality for forming a nursery, the Ceylon planters PARA RUBBER. took a far keener interest in Ceara. It has since transpired that Burma stands the best chance of becoming the successful Asiatic acclimatisation home of Para, not Ceylon, and, it may be pointed out that Sir D. Brand is at the very commencement of the interest in foreign rubbers suggested Tenasserim as a likely locality for the Heveas but made no mention of Cevlon. HI. MADRAS.—In 1881-82 Mr. Jamieson reported of the Botanic Gar-Madras. dens on the Nilghiri hills that he had received from Mr. J. Fergusson a 91 few cuttings of this rubber tree. From these he succeeded in raising one Plant. It was sent to Barliyar, and Mr. Jamieson adds, "this garden now contains plants of the three most valuable species of rubbers." Later on  $Mr_n$  M. A. Laws on reported :—"There are three young trees of this species in the Barlivar Gardens. They are about twenty feet in height, and have stems of about eighteen inches in diameter at the base. Like the Ceara and the Castilloa, they grow vigorously, and have flowered for the first time this spring, but so far I have been unable to extract rubber from them in any large quantity." In a special communication for this work the Conservator of Forests, Southern Circle, Madras, states : " There are only two young trees in the experimental garden at Manontoddy averaging 20 feet in height by 3J inches in diameter at 4 feet from the ground. Their growth is decidedly good, and the climate seems suited to them. There are numerous trees in Nilambur which have made excellent growth, but all are too young to be tapped." It will thus be seen that in Tenasserim the Para-rubber tree would appear to have found a congenial home; according to Colonel Seaton, the tree is quite acclimatised. India is thus independent of external assistance, and from Tenasserim, seed or even seedlings might be furnished to all other

from Tenasserim, seed or even seedlings might be furnished to all other parts of India, where its cultivation was thought likely to prove successful and desirable. It cannot be said, however, that all has been learned that is necessary, to place Para cultivation in India on a commercial basis. Cultivators constantly raise the questions put by Mr. Lawson in his remarks quoted below under Manihot Glaziovii, and it seems probable that acclimatisation in a new country may have lessened the volume of milk or even altered its property. The season and age at which the trees should be tapped and the method best suited to India, are points that future experience alone can solve.

#### INDIAN-GROWN PARA RUBBER.

Samples of Hevea rubber collected in Tenasserim were sent to the Secretary of State for favour of report, and the following replies were received from the Kew authorities in June 18S9:—

"I am desired by **Mr. Thiselton Dyer** to acknowledge the receipt of your letter of the 26th April last (R S. and C. 614), forwarding a copy of a letter received from the Government of India, with enclosures, reporting the results obtained from tapping- trees of **Hevea brasiliensis** near Mergui in Tenasserim.

2. T\*M><sup>o</sup>specimens of caoutchouc referred to were duly received by Parcels Post and they were subsequently submitted for valuation and report, through S. W. Sil-, ver, Esq., F.L.S., to the India-Rubber, Gutta-percha and Telegraph Works Company (Limited) at Silvertown.

3. I enclose herewith a description of the specimens, and a copy of the valuation and report received respecting them. On the whole this report is favourable. The small quantity of rubber available (in no case exceeding a few ounces in weight) rendered its manipulation somewhat difficult; but, bearing this fact in mind, the result, as shewn in the samples of prepared rubber sent in a separate cover, is very encouraging.

4. It will be noticed that the best quality, valued at 25. 3/t. per pound, i\* nearly 24A

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| INDIA-RUBBER. |  |
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Introduced Caoutchouc-yielding Plants.

| PARA<br>RUBBER. | equal to the best South American rubber. This was labelled ° Semamby," and was<br>formed by milk which coagulated immediately on the tiees in the dry season.<br>5- The rubber (marked No. 3) obtained from trees during the rainy season was<br>dried over a fire. The quality of this appears to be better than either No. 1 ror 2, and<br>it approaches very near to No. 4. Except as regards the difficulty of coag uraning of<br>rubber, there appears from these experiments to be little difference between the SP<br>cimens collected during the rainy season and those collected when the rains naa iu j<br>ceased.<br>6. All the trees tapped were young, and few were more than twelve inches in dial?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| •               | experiments should be continued, if there are sufficient trees available. If """ a be<br>dry season the milk is found to coagulate readily on the trees, this method ""gni<br>provisionally adopted with the view of testing on a larger scale its suitability w w be<br>ral use in "nWSL. Where, however, the milk does not coagulate readily, it mignt<br>advisable to try the cautious application of dry heat in the most convenient manner<br>locally available. More sun-heat, especially during the rainy season, does not appear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                 | to produce good rubber.<br>7. In South America the milk of <b>Hevea brasiliensis</b> is collected generally a y the<br>beginning of the dry season. Where the quantity collected is large, it is «* «»»» at<br>in order to prevent decomposition, to obtain the caoutchouc in a solid "jass *? milk"<br>oossible. The best Para rubber is prepared by dipping a wooden paddle in *«<br>and holding it in the thick hot smoke from burning wood and palm nuts,, which<br>first layer is dry, the paddle is dipped again and the process repeated until a thick<br>solid mass of caoutchouc is obtained. A slit is made down one side, the TUD be f is<br>peeled off the paddle, and hung up to dry."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                 | Report from ihe India-Rubber, Gutta-percha and Telegraph Works Company                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                 | (Limited), dated Sihertown, 30th May 1889.<br>The four samples of <b>Hevea</b> rubber received from Kew have been treated, with<br>sulphur in the same way as that adopted in the case of the better kinds 01 D <sup>TM</sup> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | <b>rubber.</b><br>Allowance must be made for the smallness of the quantity experimented upon.<br>Eight samples sent herewith, four each, "washed" and "curede and<br>Nofi—Has the appearance of that imported some twelve months sint -, heat<br>known as Rio rubber; is soft, and would decompose if exposed to the "ece A Jg say,<br>after washing, losing 12 per cent, in that process: its commercial value would o »<br>is. nd. to 25.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                 | No. 2—Slightly firmer: in other respects the same as No. 1. <b>reased</b><br>No. J—Percentage of loss somewhat less, and therefore of a trifling me when                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                 | value.<br>No. 4— Is found to be stronger and firmer; not so likely to decompose<br>drying: worth 2s. 3d. Owing to the scrappy nature, the loss is greater than it<br>wise would be.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ACCRA           | [APOCYNACEJE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| RUBBER.         | <b>16. Landolphia florida, Kirkii, owariensis,</b> and other species;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 93              | These are known in Commerce as ACCRA RUBBERS; whether or tained from East or West Africa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                 | <b>References.</b> — <i>Tropical Agriculturist, Vols. /., 40, 271, 291, *°4? &gt;'-rdimg'</i><br><i>i</i> <sub>5</sub> 8; <i>IIL, 727,851; V 388, 526, 767, 864; Vl.,814; VUy * ^-b »-</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | Report on Caoutchouc of Commerce ; Reports, Royal Botanice vra**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                 | Report on Caoutchouc of Commerce; Reports, Royal Botanicewra**<br>Calcutta, 1880-81, 2; Botanic Gardens, Nilghiri hills, *******<br>Kew Reports, 1877, 32; 1879, 18; 1880, 38-42; 1881, /5/<br>letin (1888), 260.; Official Correspondence from Sir J. P&f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | letin (1888), 260.; Official Correspondence from Sir J. P&f<br>Government of India, &c, &c, &c.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | the Habitat.—A genus of climbing apocynaceous plants found on vo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                 | The Hollowing Viassification of The ispecterity another attended werker attended att |
|                 | <b>L. florida or</b> iginally found in the Niger basin and now distributed over                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                 | the whole of Central Tropical Africa: <i>East Coast—'L.</i> Kirkii, common                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                 | along the maritime region, and abundant at the mouth of the Zambesi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

# Landolphia-Rubber-yielding Spedes. (G. Watt.) INDIA-RUBBER.

(shipped from Mozambique): L. florida found on the coast near Dares-Salam and extending inland, and L. Petersiana growing near Tanga on the coast of the main land opposite Pemba.

Caoutchouc--The species of these African climbers have been here collectively discussed, since, for the purpose of rubber-yielding, their differences are very small, the more so in the light of their possible acclimatisation in India It may be here remarked that the world is indebted to the exertfons of Sir J. Kirk for the East African supply of rubber. But as the species of Landolphia cannot be said to have been established commercially in India, only a few jottings need be given, and chiefly the facts regarding the attempts at their acclimatisation in India. The methed of collection of West Coast rubber from L. florida is peculiar. The milk dries so quirfcly as to form a ridge on the wound which stops the further flow, so that it cannot be collected into vessels placed on the stem. The natives collect it by making long cuts on the bark with a knife, and as the milky juice gushes out, it is wiped off continuously with the fingers, and smeared on the arms, shoulders, and breast till a thick covering is formed. This is peeled off their bodies and cut into small squares which are then said to be boiled in water (Journ. Soc. Arts, Notes by C. G. Warn/ord Lock). The West African rubber, Mr. F. T. Valdez states, is collected in June, July, and August, but he describes a process different from the above. An incision is made on the tree, and a vessel placed under it, which, by means of a conductor, is filled, in about 24 hours. From this the caoutchouc is poured into moulds of various forms, which have been well smoked with massic or palm tree, from which the gum that gives the black colour, which they consider indispensible, is procured. "The natives of West Africa are said to make playing balls from the juice of L. florida." It is also reported that in tapping these Landolphias the rubber is spoiled if the cut be made too deep as the milk obtains an injurious gum.

Sir J. Kirk describes the process of collecting rubber as pursued on the East Coast of Africa from *matere-L*. Kirkii-thus:-" The operation of tapping is very simple : a slice of the rough bark is cut off the surface, also just enough of the tree bark, when the juice starts out in drops. These dry as they are taken from the wound with the finger, and applied to the surface of the ball of caoutchouc. There is no evaporation required by exposure in vessels." An improved process is thus described by Mr. F. Holmwood: \*'A quantity of milk is daubed upon the forearm and being peeled off forms a nucleus. This is applied to one after another of the fresh cuts, and being turned with a rotary motion, the exuding milk is wound off like silk from a cocoon. The affinity of this liquid for the coagulated rubber is so great that not only is every particle cleanly removed from the cuttings, but also a large quantity of semicoagulated milk is drawn away from beneath the uncut bark, and during the process a break in the thread rarely occurs." Lieutenant O'Neill found L...^florida not easily killed by the process of collection. He observed hundreds of plants so thickly scarred with cuts that nearly |rds of the bark must have been stripped from the tree. Mr. Holmwood speaks of the *mbunga* (L. florida) as yielding a milk that does not, like L. Kirkii, coagulate quickly. Accordingly, the Maknas who were collecting it, used sand to assist this process, and not for the purpose of adulteration as was originally thought. The milk of L. Petersiana is also gathered in a fluid state by tapping and coagulated by heat. The produce is inferior to that of L. Kirkii.

In the annual report of the Royal Botanic Gardens, Ceylon, for 1880-81, it is stated that "Sir J. Kirk thinks the Landolphias (especially L. ACCRA RUBBER.

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**INDIA-RUBBER.** Introduced Caoutchouc-yielding Plants. ACCRA Kirkii), by far the most promising of the rubber plants for cultivation, RUBBER. their stems can be cut down at frequent intervals for the rubber, and  $h^{\otimes *^7}$ shoots readily spring up from the stools." The suggestion is made that shoots readily spring up from the stoops. The baggers is the rubber still in the stems might be removed by crushing them ana the stops of carbon. Owing <sup>10</sup> the the removing the rubber by means of bisulphide of carbon. Owing <sup>10</sup> favourable opinion a demand at once arose for the seeds, and Sir J. Kir in a paper read before the Linnean Society on the Landolphias, of the bas Coast of Africa said, that the natives, in obedience to this demand, nag collected the seeds promiscuously, so that he feared much disappointment would be felt by planters. Sir John values first and foremost L. Kir $\frac{1}{2}$ because it hardens very rapidly, next L. florida, because it yields a very fine rubber. The other forms, he states, are of little value. In  $\frac{1}{8}$  s. the Landolphias in the Ceylon Botanic Gardens flowered. It may I\* said 1 conclusion that Sir J. Kirk stated that in 1882 the value of the exports 01 African rubber amounted to £300,000. **CULTIVATION** CULTIVATION IN INDIA. Bengal. I. BENGAL.—Dr. King, in his report of the Royal Botanic Gardens, Cal. 95 cutta, for 1880-81, says that, thanks to the kind exertions of Dr. (now oiri John Kirk, seeds of this rubber climber have been received, and some them have germinated. In 1882-83, Dr. King reported that the Lanaoiphias appear to have found a congenial home in Lower Bengal. II. NORTH.WEST PROVINCES.—The Horticultural Society of Luckny N.W. **Provinces.** in 1883-84 reported receipt of a dozen plants of the African Landoip 96 from the Botanic Gardens, Calcutta. trom the Botanic Gardens, Calcutta. III. MADRAS.—In the report of the Botanic Gardens, Nilghin hillsi \*\* 1882-83, Mr. Jamieson writes :—'' Four of the six Landolphias \*<sup>inal</sup> y&en sented to the gardens by F. J. Fergusson, Esq., Calicut, have lately, wen planted at Barliyar. The plants are rather small and weak, but I<sup>trust</sup> if planted at Barliyar. The plants are rather small and weak, but I<sup>trust</sup> if gd care and attention to establish them.'' In the following year he repor-that all these plants were dead, but that this rubber had been <sup>succes</sup>Z<sup>trully</sup> that all these plants were dead, but that this rubber had been <sup>succes</sup>Z<sup>trully</sup> that all these plants were dead, but that a second species received <sup>Trom</sup> established at Nilambur, and that a second species received <sup>Trom</sup> dest Agri.-Horticultural Society, Madras, was doing well. The Madras ro bepartment in 1883 reporting on the results of Landolphia <sup>crMtV</sup>\*tion, stated that their plants were sickly. Further Colonel Oampbell <sup>tMalkin</sup> 1886 informed the Government of India that of Mr. Fergusson's PItor Madras. 97 1886 informed the Government of India that of Mr. Fergusson's PJ-nts of Landolphia at Calicut, only two remained alive, and that they entimed of Landolphia at Calicut, only two remained alive, and that they sniwed no growth or vigour. So far as is known, all the plants distributed by Mr. Fergusson in the Wynaad and elsewhere are dead. The twelve plant? planted by Mr. Morgan in the experimental garden at Madantod dy all died within 18 months, but the plant received from Ceylon Botanical Gardens and planted at Nilambúr in August 1882 has grown two feet nine inches and is now six feet six inches in height and is healthy and robust, In a sport to hand home the C report to hand, however, the Conservator of Forests, Southern Circle, 6n ^ it as his opinion that the climate of Madras is too cold for the Lanooip 17. Manihot Glaziovii, Müll, Arg. ; EUPHORBIACEJE. » u,t CEARA RUBBER. THE CEARA RUBBER-TREE & SCRAP-RUBBER. 98 **THE CEARA RUBBER-TREE ( SCRAP-RUBBER. references.** Journal of Botany, Nov. 1880 ; Tropical Agriculturist, Vcs  $(*)^{*}$ , 79, 3\*r, 4°h 437, 567, 57\*, 665, 9S2, 1048; II., 14, 69, <sup>7</sup>28>\$2;>3, 3fir, 40s, 629, 65/, 55', 9039,7227; III, 77, '54, '779,262, 272, 283, 290, 53'  $(*)^{*}$ , 354\*434, 449, 4\*26 6208 850, 9261(VV, 78, 85, 4'7>547; V(r)) = (2, 27, 283, 290, 53')  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*}$ ,  $(*)^{*$ . Habitat-Mr. Gross describes the Brazilian tracts on which he founathis plant as possessing « a very dry arid climate for a considerable part ot I. 98

# Ceara or Scrap-rubber. (G. Watt.) INDIA-RUBBER.

the year." The rainy season begins in November and continues to May and June. The temperature during the period of Mr. Cross's observations ranged from  $82^{\circ}$  to  $85^{\circ}$  F. The tract of country, he adds, nowhere seemed to be elevated more than 200 feet above the sea. The soil was in places a sort'of soft sandstone or gravel. In another locality somewhat further from the coast large boulders of grey granite occurred between which many good-sized rubber trees were growing.

Mr. "Cross recommends propagation by means of seed (sown in brown sand kept pretty moist); but he adds that cuttings will also take root as easily as willow. Dr. H. Tn'men of Ceylon commenting on for. Cross's recommendations says: "Experience of the plant in the Bo-tanic Garden here has proved the" general accuracy of the above remarks. There^can be no doubt of the hardiness of the species, its readiness of culture, and adaptability to circumstances. It grows equally readily from seed or from cuttings, and, though a native of a tropical sea-level, thrives well here in Ceylon up to at least an altitude of 3,000 feet, and on the most barren soils. It has succeeded equally in Calcutta and Madras, but the wet season appears to have killed it at Singapore." Dr. Trimen adds that it would not be wise to risk it in localities where the temperature is liable to fall below 60° F. In Ceylon, in 1884, there were stated to be 977 acres under this rubber, but about that time the opinion seems to have been formed by the planters that the undertaking was a financial failure. The plant either did not form enough caoutchouc, or the methods of tapping were so defective as to prove futile. The following passage expresses very nearly the universal opinion of planters : "As to rubber cultivation, my advice to those intending to plant Ceara rubber is 'don't/ To those who have a large area under Ceara rubber trees only, my advice is let them grow, but spend nothing on their cultivation such as on weeding. I have not yet found that it pays even the cost of tapping and curing of the rub-ber, and some of the trees in my charge are  $5^{-1}$  years old. We have the assurance that the trees give a plentiful supply of rubber when they are older, and I have no reason to doubt it. Meantime, I am not aware of its having proved a paying investment to anyone in Ceylon, by harvesting the rubber, therefore, I do not recommend its cultivation. It is my honest opinion, there are far too many acres under the product already, and as regards rubber, any one with land suitable for rubber, would do better to select some other product" {Tropical Agriculturist).

COLLECTION OF RUBBER.—The process described by Mr. Cross differs materially from that pursued with the Para-rubber tree. After carefully sweeping the ground around the base of the tree a few large leaves are placed on the ground. The outer surface of the bark is pared or sliced off to a height of four or five feet- "The milk then exudes and runs down in many tortuous courses, some of it ultimately falling on the ground. After several days the juice becomes dry and solid, and is then pulled off in strings and rolled up in balls or put in bags in loose masses. Only a .tJiin paring should be taken off, just deep enough to reach the milk vessels; but this is not always attended to. Nearly every tree has been cut through the bark, and a slice taken off the wood. Decay then proceeds rapidly, and many of the trunks are hollow." Mr. Cross incidentally mentions that ceara-rubber trees may be tapped on attaining "a diameter of four or five inches."

#### CULTIVATION OF CEARA RUBBER IN INDIA.

1. BENGAL.—Dr. King, in his annual report of the Botanic Gardens, Calcutta, for 188081, wrote that this plant was growing vigorously. It is the only introduced species that can be said to have taken kindly to

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CULTIVATION Bengal. IOO

CEARA RUBBER.

I. 100

Introduced Caoutchouc-vielding Plants.

MANIHOT RUBBER. Bengal, and its rapid and easy growth and adaptability to dry soils are points which strongly recommend it. In his previous report Dr. King wrote of his first attempts to cultivate this plant that when freely exposed to sun and rain, this Manihoot is a wonderfully hardy plant, capable of standing the roughest treatment, easily grown, and rapidly propagated. If its rubber turns out really good, the cultivation of this species will, no doubt, be taken up by tea-planters whose gardens are on the plains, and by indigo planters, as adjuncts to their other cultivation. In expectation of large demands for young plants and seeds\* I have made a Ceara  $f^{\wedge'}$ tation on a suitable piece of ground on the outskirts of the garden.'  $\langle \rangle^n$ 1881-82, Dr. King reported that the trees had begun to seed and that in consequence he was able to distribute a good many seedlings to planters and other in Assam, Chittagong, and elsewhere. In 1882-83, h\* reports progress in the propagation of this tree, but remarks that it is rather I? blown down or broken by the wind, especially during wet weather. From that date the annual reports of the Botanic Gardens of Calcutta make only passing allusions to the exotic rubber trees; but in a report °l\*, Chittagong it is said there are a number of trees on the road to Nazirnat "which were planted out many years ago by the road cess officials, ana these are now in a flourishing condition." As large numbers of these trees were distributed by Dr. King, they doubtless exist here and there all over Bengal. II. NORTH-WEST PROVINCES.—TWO plants of this rubber tree were N. W. received in 1880 by the Horticultural Society and planted out; in i882-»3> it was stated that while they grew they did not appear to thrive wet. Seeds received from Ceylon did not germinate. In 1886-87, the apove Provinces. IOZ plants appeared to be dying, but other plants put in the open and not watered were doing better and were 24 feet high, the superintendent of the gardens adding: "It may safely be assumed that the tree can Pr grown in this part of India, but whether profitably remains to be P<sup>r0</sup>J<sup>e</sup> In 1881-82, the Superintendent, Government Botanical Gardens, ^?r ranpore, reported: "That about 100 seedlings of this valuable <sup>ruDD</sup>] plant have been raised from the seed sent last year by Dr. Tein plant have been raised from the seed sent last year by Dr. Trimen *trom* Ceylon." In 1882-83, the Superintendent again wrote that eight of these plants kept under glass survived the winter, but all those planted in "jc open or kept in pots under the shade of trees were killed by frost, bome of those planted out were from 5 to 7 feet high at the close of the rains. They were carefully protected with straw, but they all died off during the cold season." He adds "No one, therefore, need attempt to cultivate this tree in the North-West India with any hope of success?" III. SIND.—In the report of the Government Farm and Economic uar-dens at Hyderabad for 1883, it is stated that up to date sout of the 100 seeas received had germinated. In 1885-86,1! was further reported that the largest plant we have is 7 feet high. It is subject to injury from frost During the hot season it grows freely." In 1887, the report states that Sind. 102 all the plants had been killed by frost. Uv un IV. BUKMA.—This rubber tree was introduced by Colonel Seaton wijo Burma. sent "an intelligent lad to Ceylon to receive instructions from Or. 103 Thwaites " on its cultivation. IVT-I<sup>V</sup>V¥<sup>ADRAS</sup>  $\stackrel{Mr}{-}$  Cross in 1881, after inspecting the Ceara trees 01

Nilambur, wrote: •• This region is without doubt admirably adapted tor the growth of the tree." He recommended that cultivation should be con-fined "to rather dry arid situations and poor soils." He tapped a young tree by the usual process of slicing off the bark: "The milk exuded freely, but next day on around the tree found that the Freeter portion but next day on  $*r*^{anhi}n^{a}$  on it was found that the greater portion »evaporated, showing the watery and immature state in which milk exists **I.** 104

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#### Ceara Rubber in South India.

# (G. Watt.) INDIA-RUBBER

CEARA

in young growing plants." In a recent report (June 1888) Mr. M. A. RUBBER. Laws on furnishes the following information regarding this rubber plant in South India at the present date 1-

" In the Government Gardens at Barliyar there are some fifty or sixty trees, the largest of them being about thirty feet in height, with stems having a circumference of three to four feet. They flower and fruit freely, and are spreading through the forest of the neighbouring ghat. Besides these, there, are some thousands on an estate at Kullar, situated about four miles below Barliyar, belonging to Messrs- Gordon, Woodroffe & Co. of Madras. There are also some thousands of trees on th Government Teak Plantations at Nilambur; and in addition to these, there are many spread about over the Malabar and Wynaad districts, notably some of the finest on Mr. Fergusson's grounds in the vicinity of Calicut. The tree grows very rapidlyi and, to all appearance, thrives well; but 1 have been wholly unable to extract rubber from it in anything like a paying quantity, and every one else hitherto has also failed. The following is a letter which I wrote a short time ago to Messrs. Gordon, Woodroffe & Co. on the subject, and which gives in full the difficulties I have to contend with:--\* In continuation of my former letters on the subject of extracting rubber from the *Ceara*, 1 am very sorry to state that I have little or no information of any value to give you.

I have written to Kew and Cevlon to know if they could help me; the authorities at the former place have promised to make inquiries on the subject, of their West Indian correspondents, but I have not as yet received news from them. Dr. Trime n of Ceylon is in the same straits as myself, and has failed in all his experiments to extract the rubber in paying quantities.

- The following are the chief points which I have paid special attention to:— (1) Do our trees in India really produce as much rubber as they do in their native country 2

(2) Are they as yet too young to yield rubber in large quantities?
(3) What is the best time of the year for tapping the trees?
(4) What is the best mode of tapping?
With respect to the first consideration, I cannot believe that the yielding properties of the Cearas should have decreased on account of their having been transplanted to the first construction to their maximum terms of the best in the state of from Brazil to Southern India; at any rate, I can give no scientific reason for believing that such is the case.

With respect to the second consideration, we have now trees that are over three feet in girth; and one would think that a tree of that size would be sufficiently old to show what its full yield would be.

The third point is the one to which I desire particularly to call your attention. have made myself a large number of experiments with the view of finding out what the best time of year for tapping the trees is likely to be. The trees, as you know, lose their leaves at the beginning of the year; and do not regain them till after the early rains have set in. During this period of the year, the sap is quiescent, and there is very little exudation of the milky juice, which contains the rubber.

The least want of success which I have gained in my experiments has been when 1 have tapped the trees just at that time when the new leaves are beginning to show themselves, and so on till they have become matured; that is, during the months of May and June; and I would suggest that you should try the experiment upon a large scale in your Ceara forest at Kullar during; the present season.

With reference to the fourth consideration, *vie.*, the best mode of tapping, I can only tell you how I have proceeded. I have cut out wedges with an axe, and made incisions of various sorts, with knives and chisels, and 1 have followed the process which \*KO& described by Mr. Cross as being the one adopted by the natives in Brazil. This latter process is conducted as follows:—

(1) Peel off the outer brown bark, when the smooth green inner bark will be exposed. In this latter bark make incisions with a very sharp knife, forming a series of V's. The latex, it is said, which springs from the several gashes, unites into one stream, and is deposited at the apex of the V, where it is collected in tins, stuck into the true of the true of the true of the later to the late into the tree at that point; but in all my experiments, I have never found the latex to flow in such quantities as to form anything like a stream.

(2) The other method which I have adopted was one which was suggested to me by Dr. Trimen. He took an ordinary wood-marking implement, and cut out deep channels in the bark, instead of making gashes; the latex, when the tree is under this treatment, is certainly given up in larger quantities/and the rubber is more easy 377

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CEARA RUBBER.

#### History of the Discovery and

to collect, as the size of the groove is sufficient to allow the workman to scoop.  $^{\circ}$  ut the rubber with a stick. I would recommend your trying this form of  $^{extrac}$ ?  $f_{f_{1}}$  rubber on a larger scale than I have been able to do; you might also attempt rej.  $j_{r_{1}}$ of litate a greater exudation of the latex by beating the tree with a mallet, thoug» course not too violently, otherwise you might destroy the tree itself. out

I am very sorry not to be able to give you any more satisfactory information,

I hope that, in time, we may discover where it is that our want of success lies. up into I do not know if you are aware that the roots of the *Ceara* often swell up into tuberous-looking masses, resembling a yam; they are full of starch very like that of tapioca, both in taste and other properties; me unders n oonea, up into a transmitter of the tapioca plant, that they com.\*" poison, something perhaps might be made from these roots."

The Conservator of Forests, Southern Circle, Madras, has furnished W<sup>r</sup> this work, the following remarks regarding the South Indian Ceara rus ber trees: "The Ceara rubber grows both in Wynaad and in <sup>N I t a r</sup> \* <sup>o</sup> A u, a weed. The largest tree in the experimental garden at Manontoday of several hundred is about 30 feet high with a crown of foliage  $4^\circ * \&$ diameter and a trunk 45 inches in circumference at 4 feet from the fil This tree is only five years old. On being tapped, the trees yield very i « ^ rubber and the cost of collecting the milky sap is greater than the vain the rubber obtained from it. Commercially this tree is, therefore, a tau ure at any rate for the present"

therefore, to be the only difficulty that now exists. The trees " $ay^e J * A^a$ quite acclimatised, but either they are too young or do not yield making the same amount of milk as in Brazil. It is possible to be a similar the same amount of milk as in Brazil. It is possible that the defect  $\mathbf{m} \mathbf{k}$  is lie in imperfect modes of tapping, or perhaps from the tree  $\mathbf{b}^{ein} \wedge \mathbf{f}^{ro} \wedge \mathbf{f}_{or} \mathbf{m}$ . region where a peculiar condition of vegetation takes the place of milk-ing. Cultivation of acclimatised stock in parts of India, where in kiai  $\frac{accl}{n_0 w}$ ing. Cultivation of acclimatised stock in parts of India, where in <iai  $n_{oW}$  matisation would have been impossible, might correct the defect trive  $n_m$ retards the enterprise of Ceara and other foreign rubbers. Man**y**<sup>xa</sup> j j pies might be cited in support of the idea of improved or determuly in fileaccompanying successful cultivation in a new country, for <sup>exa</sup>i<sup>T1</sup>P ell' Sia<sup>\*</sup> haviour of Cannabis sativa (Hemp) in Europe, India, and <sup>Ce</sup>"tr We case or Linum usitatissimum (Flax), t in Europe and India. If it be "V  $j_s$  that trees of equal age in Brazil and the localities of India where Let  $h_e$  being cultivated yield different proportions of milk, the cultivated  $h_e$  of f tree should not be abandoned until it had been tried in every Oisig u India, where its cultivation was at all possible. If it be found that if available tract of country in India can Ceara be grown profitably\* then, but not till then, should the hope of ultimate success be abandoneo. seems probable, however, that greater experience in methods 01 treater, and modes of tapping, together with more precise information as to age and season at which the milk flows in greatest abundance, may result in the attainment of better results than have as yet been reported.

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#### HISTORY OF THE DISCOVERY AND UTILISATION OF INDIA-RUBBER. AJL,

The earliest known mention of India-rubber is the remark by Herr? in connection with Columbus' second voyage (nearly 500 years ago) of the inhabitants of Hayti playing a game with balls made from the gum 01 tree. These balls, J he remarks, though large, were lighter and bounae better than those of Castile. A more direct allusion to rubber  ${}^{\circ C_{A} u_{A'}}$ however, in Torquemada's De la Monarquia Indiana (published at ....a...

<sup>\* {</sup>Con/, with the remarks in Vol. II., pp. 104-105.)

<sup>+ (</sup>Conf. with flax culture, Vol. V.)

t {Con/, with the remark regarding playing balls made of rubber under p. 373-/ I. 105

# Utilisation of India-Rubber. (G. Watt) INDIA-RUBBER.

rid in 1615) where the tree is said to be known to the Mexican Indians as *(IlequahuitU* A white milky substance, Torquemada says, which was thick and gummy and found in great abundance is got from it\* This is collected in calabashes and afterwards softened in hot water or the juice is smeared over the body\* and rubbed off when sufficiently dry. He also remarks that an oil is extracted from the *ulli* or rubber by heat which possesses soft and lubricous properties, and is of special effect in removing tightness of the chest. It was also drunk by the Mexicans with cocoa to stop haemorrhage.

Torquemada mentions that the Spaniards at the time of his visit used the juice of the *ule* to waterproof their cloaks, and he adds that "it is of great effect in resisting water, but not so the sun, for the rays thereof melt it." Perhaps the earliest accurate description of the South American caoutchouc-yielding plants is that given by Condaminein 1735. He speaks of the natives moulding the fresh juice in various forms, producing bottles, boots, and bowls, which may be squeezed flat and yet recover their form when no longer under restraint. The Portuguese of Para learnt from the Omaquas to make syringes which had no need for a piston or sucker. They were hollow, pear-shaped, with a pipe at the mouth. When compressed and held under water they filled with the fluid on being freed from pressure, and squirted it through the pipe when again compressed. This use of the milk led to the Portuguese name *Pao di Xirringa, i.e., "Syringe Tree."* 

These faqts did not, however, attract attention in the Old World till nearly a century later. Priestley, for example, mentions caoutchouc in the preface to his work on Perspective (1770) as a valuable material for erasing pencil marks, which might be purchased from Mr. Hairne, Mathematical Instrument Maker, opposite the Royal Exchange, at a cubic piece of about half an inch for three shillings. Hence the name India-rubber. The slow progress made by caoutchouc in the early stages of is European history is the more remarkable when it is added that the need had long been felt for some water-proofing material and a patent was taken out ir 1627 for <sup>w</sup> a newe invencon for the making and pparing of ctaine stuffe and skynns to hould out wett and rayne." The first patent granted for the use of India-rubber water-proofing was held by Samuel Peal in 1791. In 1813, Mr. John Clark obtained a patent for making air-beds, the inner layer of which was made air-tight by being coated with a solution of caoutchouc dissolved in spirits of turpentine boiled in linseed oil. The dawn of the great India-rubber era may, however, be said to have broken with the first of Mr. Thomas Hancock's patents in 1820. Hancock has accordingly been spoken of as " the father of this important and wonderfully increasing branch of the arts." A useful service was also rendered by Mr. Hancock in the publication of his 'Personal Narrative of the Origin and Progress of the Caoutchouc or India-rubber Manufacture in England, London, 1857.' In 1823 Mr. Charles Mackintosh of Glasgow obtained a patent jjpr making two fabrics water-proof by uniting them with a solution of ruD&er called ' water-proof double textiles,' the material used in the preparation of the now famous Mackintosh over-coats. In India about this time also Sir W. O'Shaughnessy reported that he had made a waterproofing fabric of a double layer of cloth with rubber between which might be used for surgical purposes. One of the greatest advances, however, was the invention of Hancock's <sup>c</sup> masticator' which tears the rubber to pieces and afterwards consolidates it into a homogeneous mass from which all impurities may be washed out and the rubber pressed into blocks or

<sup>\* (</sup>Con/, with methed of collecting Landolphia rubber in Africa, p. 373.)

DISCOVERY & UTILIZA-TION. History of the Discovery and

sheets. Prior to this invention the crude rubber had to be prepared in a peculiar manner so as to allow of its being cut into sheets and strings. The passages quoted above, from the Agn-Horticultural Society's Journals, contain directions for collection, so as to adapt the rubber to the then only known way of utilising it. Hancock's masticator dispensed with that necessity. An important feature of Mackintosh's discoveries was the utilisation of naphtha as the solvent, and Hancock's masticator having purified the caoutchouc, thus facilitated its rapid solution in naphtha. The curious discovery that caoutchouc stretched and retained for some time while kept cold, loses its elasticity, led to the invention of the elastic web by which fine threads of rubber could be worked up in a braiding or other machine and have their resilience restored by a hot iron being passed over the fabric. But the full utilisation of 1 ndia-rubber was only realisecj, by  $\overline{W}_{r}$ . Walter Hancock's discovery of what is now known as Vulcanizing Walter Hancock's discovery of what is now known as Vulcanizing. was attained in connection with experiments conducted with the object oi divesting caoutchouc of its adhesiveness, thus allowing of water-prooning garments of single textiles having a surface coating of rubber instead oi Mackintosh's double textiles. A sample of rubber obtained from America smelt of sulphur, but though this fact was noted Hancock followed up ws own researches and produced inadhesive rubber by combining it with silicate of magnesia and other substances such as fuller's earth, whiting, ochre, asphalte, &c. Having ascertained that rubber could be subjected to a temperature (240° Fh.) sufficient to melt sulphur without destroying the rubber he plunged pieces of rubber into a sulphur without desitelying the rubber he plunged pieces of rubber into a sulphur bath and obtained thereby a hard horny material penetrated but not chemically,  $a^{\text{it}}_{\text{ered}}$  by sulphur. By raising the heat to  $270^{\circ}$  or  $280^{\circ}$  Fh<sub>o</sub> at the end ot an hour, he found the caoutchouc had taken up all the sulphur that it could retain, vie., about 2 to 3 per cent, by weight. On subjecting these pieces of caoutchouc in an inert medium to a temperature of  $^{2}75^{\circ}$  to 320° Fh.; a chemical reaction took place, the rubber losing all tederecive properties but retaining all the peculiarities to which it owes us high posi-tion in the arts. By causing the penetration with sulphur to be effected by means of his hot rollers and masticator, Mr. Hancock obtained a substance which could be dissolved and applied to textiles. Commenting on the importance of Vulcanization, Mr. James Collins writes:-" Stage as were the applications of caoutchouc in its natural or una<sup>ste</sup> forms, it seemed at one time as if it were likely to fall into disuse, or the its applications would have to be circumscribed from certain defects, manufacture had been carried on in two ways: first, by direct mecnanical treatment of the gum after simple cleansing; secondly, by the action of some volatile solvent, and the application of the solution to some <sup>ma</sup>J<sup>erla</sup> so that a film of caoutchouc was left on the surface. But it was touna that such caoutchouc became rigid and inflexible under the  $*^{n_A uenC_A} ues^{n_A}$ cold, while it softened and ; ecomposed in the sun and hot weather, tn' defect alone rendering many manufactured goods a total loss, and causing, it is said, the failure of several American firms. Contact with greas!\* or any kind of fatty or essential oil quickly dissolved it, and perspiration had the same effect though slower in its action. It was also very adhesive and sticky, so that any substance pressed against its surface was quickly joined and could not be separated. By continued use or tension it lost its elasticity, and, besides this, an unpleasant odour produced by its solution pervaded the goods. But at the most critical time the method of Vulcanization was discovered, which, while preserving and even heightening the Properties for which it was valued, added to its stability and divested it of the defects which were so many barriers to its present sue cess and future extensions. Caoutchouc so treated was found to have I. 105

# Utilisation of India-rubber. (G. Watt.) INDIA-RUBBER.

almost perfect elasticity at *all* temperatures below 239<sup>0</sup> Fh., and not to become adhesive below \*a heat of 212<sup>0</sup> Fh<sub>M</sub> while fresh cut edges did not unite as in the unchanged substance. Its resistance to solvents too was very marked; though not absolutely insoluble, and iis capability of being inadhesive and unaltered by cold, heat, water, or solvents, opened at once a new field of industry."

The honour of this discovery is claimed in Germany by Hindersdorf, and in America by Goodyear, and it is probable many persons were working on the same lines about the period of Hancock's discoveries. Two years later (1846) Mr. Alexander Parkes took out a patent that gave an ulterior mode of Vulcanizing. By the employment of a solution of chloride or hypochloride of sulphur in bisulphuret or sulphuret of carbon, coal, naphtha, or turpentine, he obtained the same change as described above in Hancock's process of Vulcanization. Speaking of this process Mr. Collins writes :—<sup>∞</sup> Caoutchouc in the dry state, if kneaded with a certain amount of dry chloride of sulphur, slowly underwent the same change, and whilst hot could be pressed into any desired shape. Caoutchouc, previous to being submitted to the "changing," could be combined with wool, flax, cotton, wood or cork dust, earths, oxides of metals and with other gums. By this process, however, only thin sheets could be subjected to this method, as in the case of thick sheets, the action on the outside would have proceeded too far before it had penetrated to the centre. After the articles were taken out of this baih, they were placed in a hot chamber and then washed in water or in a solution oi caustic potash, or soda.

Vulcanized rubber may be hardened by various processes until it can be cut like ivory and hence it became applicable to a numerous series of new purposes such as the manufacture of combs, backs of brushes, in fact it was rendered suited for all the industries in which bone, ivory, whalebone, tortoiseshell, &c, are required. It might even be coloured to any shade and built up in mosaics, made into railway buffers, used as pavements, or a thousand new applications for which the natural rubber was quite unsuited. It could be moulded or engraved, or have its surface only hardened by Parkes' process. Goloshes manufactured and then Vulcanized were found to be superior to those made by any other process. Various patents were also taken out for other methods of hardening caoutchouc, such as by means of iodine or of bromine or of both and with or without sulphur, the discoveries thus widening and extending the uses of India-rubber until it may be said that substance has become an indispensable necessity of modern commerce.

The above brief sketch, compiled from most modern writers but mainly from Collins<sup>1</sup> various papers (in the British Manufacturing Industries, in the *Encyclopaedia Britanica*, &c.) will suffice to give some idea of the properties of caoutchouc as now manipulated; and to show that its extensive modern application justifies the importance given to it in tropical agriculture and forestry. To complete this sketch, it need only be necessary to brieflyjreview the Indian trade statistics of the substance.

# INDIAN TRADE IN CAOUTCHOUC.

Mr. J. E.O'Conor, in his Review of the Trade of British India for 1874, gives a retrospective account from 1868-69. "The trade, he says, for i874-75> <sup>was</sup> somewhat less than in previous years and still less than in 1872-73\* the supply of the market of shipment being somewhat uncertain under the conditions in which the rubber is collected by jungle tribes." "The exports of Bengal are much larger than those from Burma All the caoutchouc brought down to Calcutta is produced in Assam." **Mr. O'Conor** then gives the figures of exports, the average for the five

INDIAN TRADE. **106** 

Indian Trade in Caoutchouc.

years ending 1872-73 being 12,003 cwt., valued at £63,217, but for 1873\*74 INDIAN TRADE. they were 16,837 cwt., valued at £117,775 and for 1874-75\* J5>.%3[cwu, valued at £108,645. Mi\O'Conor then remarks: "The trade is sharea by Bengal and Burma, but by the former in much the larger proportion<sub>c</sub> The exports from Bengal fell off during the year from 16,255 cwt. wonn £115,754 to 13,938 cwt. worth £96,492. The exports from Burma, on the other hand, increased from 582 cwt., worth £2,020 to 1,954 cwt. wori £12,104. The export trade from Burma only commenced KI \*PP\*~1 able quantity, in 1873-74. All or nearly all the caoutchouc exporter from that province is produced in Upper Burma." In the corresponder defined as  $P = \prod_{n=1}^{\infty} ds$ ence quoted at page 346 the exports from Calcutta were 514  $^{ma}$   $U_{t}$ in 1836. In 1880-81, Mr. O'Conor reported a decline in quantity, DU increase in value, and in the following year he remarked that the  $e^{x}P \circ T^{fs}$  were 10,699 cwt., valued at R 10,88,426. "The shipments, he there staie^ are entirely made from Calcutta and ports in Burma, and the  ${}^{coun}J^{r}_{T}$  ie  ${}^{t}_{test}$ which the article is exported are the United Kingdom and the Unit, States of America, small quantities being sent also to the Straits oeulements and Egypt. The shipments to the United States show a consider able increase compared with the previous year." In 1885-86 the exports are pointed out as continuing to decline; in the following year the trade nad slightly improved. In 1888-89 the IMPORTS FROM FOREIGN COUNTM\*S were 53 cwt. valued at R6,i47, and the EXPORTS of FOREIGN MERCHAN-DISE were 52 cwt., valued at R8,630. These imports came mainly trom Madagascar to Bombay and were exported to the United Kingdom ana France. These transactions show, therefore, a certain amount of the 11ew African trade in rubber falling into the re-export route, that much or the African and Madagascar produce has followed from time imroem rial Of the Rubber of Indian produce there were EXPORTED to \*\*\* COUNTRIES, in 1888-89, 8,673 cwt., valued at R9,67,348 : this went irum Bengal, 5,609 cwt, and from Burma, 3,064 cwt. As in former Vear? the Indian caoutchouc of 1888-89 went chiefly to the United Kmgaon, United States, and Egypt. o T olO

The coastwise transactions last year were 118 cwt., valued at  $\mathbb{R}^{*1*}$  rts IMPORETD and 2,842 cwt., valued at R3,58,ii3, EXPORTED. The impond were mainly from other Bengal ports (Chittagong) into Calcutta.1.ft set the exports were from Burma into Bengal (namely, 2,731 cwt.). An set transactions, of course, overlap each other and to a certain extent reappers in the FOREIGN EXPORTS. Thus the Bengal exports to foreign countries would doubtless comprise Assam, Chittagong, and Burma rubber, but the exact amounts of each kind cannot bs made out since the Bengal consumption is not known.

The trans-frontier trade is mainly into Assam and Chittagong, and the figures for this trade have already been given (see page 356). To wnat extent, if any, a transfrontier export trade may take place from \*\*"" to China and other countries beyond that frontier, is not known ; but we are told the contractors paid Government R 1,00,000 for the right to collect and purchase rubber while the declared value of the foreign and Joastwise exports from Burma were valued at R7,06,378.

It will thus be seen that the Indian trade in caoutchouc  $|P^{ran} \times$ suddenly into importance, and from 1872 fluctuated forward until <sup>1882</sup>"?3? when it reached its maximum in the value of Ri2,59,165, and from wn\*n date it may be said to have fluctuated downwards. The whole of this rubber since about 1875 has been drawn from the indigenous tree ana mostly beyond the British frontiers of Assam, Burma, and Chittagong, the cultivated and acclimatised trees not having as yet contributed to the **supply**.

(**G**.

Watu)

# INDIGOFERA, Linn.; Gen. PL, U49+

A genus of herbs or shrubs pelonging prises some 250 or 300 species, an tributed be readily recognised as being the plobe, India having about 40. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate lea. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate leas. They may  $\wedge \ c^{h}$  lear laterally attached papilionaceous plants, with inoparipinnate leas. They may here a box in the transformation of the plants, ascending the digenous species that are spoken of as w. ely distance that there is a marked decrease in the number of forms and abundance ot individuals. This sketch of the distribution of the Indian species may be viewed as of considerable interest when jt is added that Bombay is the only region where a botanist has spoken of Indigofera tinctoria (the true Indigo) as having been seen in what appeared a wild condition. The older records of commercial indigo also point to the Western Presidency (or the basin of the Indus) as the region of supply and earliest manufacture.

The following enumeration of the species of Indigofera comprises only those regarding which economic facts have been published. About as many more are Known to the Natives and bear specific vernacular names in the regions where they occur.

Indigofera Anil, Linn.; Fl. Br. Ind^ IL<sub>9</sub> gg; LEGUMINOS-E.

1

Vern.— Vilaiiunil (European Indigo), HIND.; Shimaiya-viri, TAM.; Shiinanili, TEL.; Skimenili, KAN. (Foreign Indigo in TAM., TEL., and KAN.); Vishashodhani, SANS. The Sanskrit name is derived from shdd to clear and visha poison.

Habitat.—This species is admitted by botanists to be purely American. It was cultivated by the Spaniards in Mexico and by the Portuguese in Brazil as a source of indigo. It nowhere exists in a wild state in India, and was probably introduced during the period of Portuguese ascendancy in the Western and Southern Presidencies. It is nearly allied to I. argentea *var*. ccerulea as may be seen from the fact that Kurz reduces that form to this species.

Dye.--The dry leaf indigo of Madras is to some extent obtained from this species. The reports furnished by the Madras Government, in connection with this work, do not afford sufficiently detailed information to allow of an opinion being formed as to the relative degree of cultivation of this species and of I. tinctoria. Nor do they supply the means of enabling us to judge as to their relative value as sources of the dye, but it may be presumed that tinctoria is superior, from the fact that mention is made of that species displacing Anil. The reader is referred for further information to the account of INDIGO in the pages below.

# I. argentea, Linn., m. Br. Ind., II., g8; also var. ccerulea.

Often called WILD INDIGO.

Syn.—INDIGOFERA CCERULEA, Poxb.; I. RET us A, Grdh.; 1. BRACHVCARPA, Grah.f I. TINCTORIA, var. BRACHYCARPA, DC. Prod.; 1. TINCTORIA, Forsk., Egypt.

Vern.—Surmainil, HIND; Nil, MERWARA,- K&rwnili, TEL.; Kat~ave'ri (according to Ainslie), TAM.J Karu-nili, KAN.; Kdlaklitaka, SANS. The above names mean black indigo. 107

DYE. 108

109

I. iog

**INDIGOFERA** 

argentea.

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| INDIGOFEE                  | RA One of the Wild Indigoes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| atropurpur                 | ea                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                            | <b>References.</b> -/?***., Fl. Ind., Ed. C.B.C. 583,5?4;A <sup>TM<sup>SI</sup></sup> f> f <sub>7</sub> . milot,<br>II., 34; Dalz. & Gibs., Bomb. Fl., 59; DC, Ortg. Cult. f'%% forester,<br>Fl.Andk., S <sub>7</sub> ; Murray, PI. and Drugs, Smd, u6; Inata<br>XII., App. u; Duthie, Report, Flora Merwara.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                            | XII., App. $u$ ; Duthie, Report, Flora Merwara.<br>HabitatA shrubby plant, according to the $Fl^{\circ}ff$ *Y* plains at found in the plains of Sind, the wariety coender $M$ IM $M = M$ plains at found in the plains of Sind, the wariety coender $M$ IM $M = M$ plains at found in the plains of Sind, the wariety coender $M$ IM $M = M$ plains at found in the plains of Sind, the wariety coender $M$ is below the felliot in Banda. It was, however, apparently found by $w^{\circ x}$ boars plain below the Telegu country, and Mr. Duthie has recently $P?TM ^{\circ}M = M$ below the Telegu country. It increases the fourth of                                                                                                                 |
|                            | the Telegu country, and Mr. Duthie has recently ${}^{re}P?{}^{TM}\%''{}^{5}$ Bengah<br>at Merwara. Kurz's I. tinctoria var. AnAtfour. Astatic ^ ${}^{over}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                            | <i>XLV.</i> , 1876, 26 <sub>9</sub> ) is apparently var. ccerulea, and if so, it on tributed to<br>Burma from Ava to Martaban and Tenassemn. It.is.OK cultivated<br>Arabia, Egypt, and Abyssinia; and according to DeCandoiie,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| DYE.                       | in Egypt and Arabia. ". extr«ct indigo<br>DyeRoxburgh states that, although he was able to exis could not                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| XIO                        | of good quality from this species by the ordinary $P_{o}^{cess}$ , $P_{o}^{cess$ |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| III                        | for its dye property.<br>Indigofera aspalathoidefS, VahL; II. Br. Ind., II., 94; Wigni,<br>Syn.—I. ASPALATHIFOLIA, #0#&.; ASPALATHUS INDICUS, W <sup>in</sup> , LESPE-<br>DSZA JUNCEA, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                            | DSLA JUNCEA, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                            | Vern.—Nil, PB.J Shevenar-vaymU, or shivdnarvembu {snvu(n shiva>s, Jas-<br>ern.—Nil, PBJ ShevenarvaymU, gryshivdnarvembu {snvv Aijes} idas=<br>for Shiva, and vembu, the Neem Tree), TAM.', s^ ' t o Ainslie)-<br>Bitted)s Hattim Manneli, MALAY. >, Shevdmarba (according-yy Covion Plas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                            | Bhive) statim, Manueli, MALAY. >, Shevdmarba (according W. Ceylon Pl.,<br>References.—Roxb., Fl. Ind., Ed. C.B.C., 582; Thwaites, En. Ceylon Pl.,<br>83; Dals. & Gibs., Bomb. Fl., 58; Rheede, Hort. Mal., 1X., t. 37;<br>Ainslie, Mat. Ind., II., 385; Dymock, Mat. Med. W. Ind., 2nd Ed.,<br>215; Bidie, Cat. Raw Pr., Paris Exh., 52; Drury, U. Pl., 277; McCann,<br>Dyes and Tans, Beng., 93; Cooke, Oils and Oilseeds, 49;<br>Cyclon 337'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| OIL.                       | <i>Cyclop.</i> , 337'<br>HabitatA low under-shrub of the plains of the Carnatic ana j                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Root.<br>112               | Roxburgh speaks of it as found on dry lands near the sea <b>ich</b> 1.guse(j<br>Oil- Rheede says that an oil is obtained from the ROOT, wn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MEDICINE.<br>Leaves.<br>"3 | to anoint the head in erysipelas writes :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Flowers.                   | The LEAVES, FLOWERS, and tender SHOOTS are said to be coanferous                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 114<br>Shoots.             | The whole plant rubbed up with butter is applied to $TM^{-4}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| US<br>Root*                | tous tumours. A preparation is made from the ASHES $\circ$ $\mathbf{a}_{tQa} \mathbf{b}$ -plant to remove dandriff from the hair. The leaves are $\mathbf{a}_{p}\mathbf{P}''\mathbf{b}_{he}$ head                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| xi6<br>A <b>Sh</b> es.     | scesses, and the OIL obtained from the root, is used to anom^.<br>in erysipelas. Dr. Dymock adds that he has not seen the pian<br>medicinally in Bombay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>113</b><br>Oil.         | I. atropurpurea, Ham., Fl. Br. Ind., IL, ion Wight., Ic,t-3 9-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8                          | SynI. HAMILTONI, Grah.<br>VernBankati, kala, sakena, sakna, HIND.; Khentt, juna,<br>Kath <sub>iv</sub> gorkatri, KASH MR<br>ReferencesRoxb., Fl. Ind., Ed. C B.C., 586; Voigt, Hort. Sub. Cal., 212;<br>Brandis, For. Fl., 136; Gamble, Man. Timb., 117; Siewart, Botanising<br>Brandis, For. Fl., 136; Gamble, Man. Timb., 117; Siewart, Botanising<br>Tour in Hasara, 67; Atkinson, Him. Dist., 308, 340, 472; Duthie<br>Tour in Hasara, 67; Atkinson, Him. Dist., 308, 340, 472; Siewart, Solari, 59-<br>and Fuller, Field and Garden Crops. 43; Gas., Mysore and Coorg, I., 59-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                            | Tour in Hasaro, 67; Atkinson, Him. Dist., 308, 340, 417, 1, 59.<br>and Fuller, Field and Garden Crops, 43; Gas., Mysore and Coorg, 1., 59.<br>I. 119                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                            | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| I DE REG RETINV OF WAGTAS. $(G Waff)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DIGOFERA<br>er <u>ardiana.</u>                             |
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| Habitat. —A small shrub of the Salt Range, from 2,500 to 5,000 f <sup>^</sup> et,<br>and outer Himålaya from Hazara to the Khasia Hills, ascending to 9,000<br>feet but found as low as 1,200 feet on the Siwalik Hills.<br>Fibre.—The TWIGS are used for basket-work and bark bridges.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | FIBRE,                                                     |
| <ul> <li>Indigofera cordifolia, Heyne; FL Br. Ind., II., 93.</li> <li>Vern. — Vekriaxas (Merwara), RAJ* 5 Godadi, bodaga, botsaka, BOMB.</li> <li>References. — Dale &amp; Gibs<sub>1</sub>, Bomb. FL, 58; Aitchison, Cat. Pb. and Sind PL, 40; Murray, PL and Drugs, Sind, 114; Drury, U. PL, 276 g Lisboa, U. PL Bomb., 197; Gaz., Mysore and Coorg, A, 56; GOB., NW. P., I., 80; IV.9 Istx*; Indian Forester, XII., App. 2, 11</li> <li>Habitat. — Plains throughout India proper, ascending to 4,000 feet in</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120<br>121                                                 |
| the Chenab Valley. Distributed to Afghánistán, Baluchistán, Nubia,<br>the Mal <sub>%</sub> iy Isles, and North Australia.<br>Food.—SEEDS eaten in times of scarcity and famine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | FOOD.<br>Seeds.                                            |
| I. Dosua, Ham.; FL Br. Ind, II., 102.<br><sup>1</sup> Syn.—I. HETERANTHA, Wall.; I. v IRQ AT A, Roxb. t also var. TOMENTOSA,<br>Graft, f I. STACHYODES, Lindl.<br>Vern.—Khenti, shagali, mattu, kuskeri, PB.; Theot, kathewat, kati,<br>SIMLA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 122<br>123                                                 |
| <ul> <li>References.—Roxb., FL Ind., Ed. C.B.C., 586; Voigt, Hort. Sub. CaL, 212; Atkinson, Him. DisL, 308, 340, 472; Settle. Rept. Simla, App. 2, xliv.</li> <li>Habitat.—A shrub of the Temperate, Central and East Himálaya—Simla to Bhotan and Assam; 6,000 to 8,000 feet.<br/>Food and Fodder.—The FLOWERS are said to be eaten in Kangra as a pot-herb. Prized as a fodder for sheep and goats; buftalos are also said to be fond of it.</li> <li>I. enneaphylla, Linn.; FL Br. Ind., II, 94; Wight, Ic, /. 40j.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FOOD:*<br>FODDER.<br>Flowers.<br>124                       |
| <ul> <li>This is the RED NERINJY of Madras.</li> <li>Vern.—Bhingule, MAR.; Sheppunerunji, (=Red Plant), TAM.; Yerra palleru, chalapachchi, chera-gaddam, TEL.; Kenneggilu, KAN.; CherupnHate, MALAY.; Vasuka, SANS.</li> <li>References.—Roxb., FL Ind., Rd. C.B.CS84; Voigt, Hort. Sub. CaL, 211; Tkwaites, En. Ceylon PL, 411; Dale. &amp; Gibs., Bomb. FL, 58; Aitchison, Cat. Pb. and Sind PL, 40; Ainslie, Mat. Ind., II., 74; O'Shaughnessy, Beng. Dispens., 293; Dymock, Mat. Med. W. Ind., 2nd Ed., 21\$; S. Arjun, Bomb. Drugs, 201; Drury, U. PL, 277; McCann, Dyes and Tans, Beng., 93; Balfour, Cyclop., 337.</li> <li>Habitat.—A small, trailing, much branched shrub. Met with In the phins of India and ascending the Himálaya to 4,000 feet; distributed to Ceylon and Burma, the Malay isles, and North Australia. Medicine.—Ainslie remarks that the JUICE of this plant is used as an antiscorbutic and diuretic, and is considered alterative in old venereal affections.</li> <li>Fodder.—Roxburgh regards it as one of the most useful plants of pasture lands; it is employed as human food in times of famine.</li> <li>I. Gerardiatia, Wall.; FL Br. Ind., II., 100.</li> <li>Var. heterantha.</li> <li>Syn.—I. DOSUA, Wall.; I. VIRGATA, Roxb.; I. QUADRANGULARIS, Grak.; I. POLYPHYLLA, DC.</li> <li>Vern.—Kati, khenti, mattu, kutz, shagali, khenti, kdtsu, PB.; Kathi, theot, kathu, SIMLA; Kaskai(PUSHTU), AFG.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 586; Brandts, For. Fl., rjc., Gamble, Man. Timb., 117; Stewart, Pb. PL, 70; Stewart, Bot. Tour in Hazara, IS; Atkinson, Him. DisL, 308, 340,472; Gazetteers.—Dera Ismail Khan, 19; Bunnu, 23; Rawalpindi, 75, Balfour, Cyclot. 337</li> </ul> | 125<br>MEDICINE.<br>Juice.<br>126<br>FODDER.<br>127<br>128 |
| Ismail Khan, 19; Bunnu, 23; Rawalpindi, 75; Balfour, Cyclot. 337<br>Jour. Agri. Hort. Soc. Ind., VIII. (SeL), 155.<br>I. 128                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                            |

| paucifolia                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| ľ                                   | Habitat—A low copiously branched shrub of the North-West Himalay<br>and the Eastern skirts of the Suliman Range, ascending to 8,000 feet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| FIBRE.                              | Distributed to Afghanistan. The variety heterantha is also found in th<br>Khasia Hills and Bhotan.<br>Fibre.—TWIGS are employed for basket-work and in making r°P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Twigs. <b>129</b>                   | bridges.<br>Structure of the Wood.—Hard, white, with an irregular heartwood 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TIMBER.<br><b>130</b><br><b>131</b> | dark colour. Weight 56R per cubic foot.<br>Indigofera glandulosa, Wtlld.; Fl. Br. Ind., II., 94; Wight, Ic, t.33                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                     | Vern.—Vekhariyo, MAR.; Barbed, SHOLAPUR; Gavacha <sup>^ain</sup> f^u<br>KALADGI, BOMB.; Vekhariyo, baragadam, barapatdlu, bootnia*r».<br>barapatam (Madras), TEL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                     | References Roxb., Fl. Ind., Ed. C.B.C., 583; Voigt, Hort. Sub. Cal<br>211; Dals. & Gibs., Bomb. Fl., 58; Fl. Andh., Elliot. 23, 30; Dymoch<br>Mat. Med. W. Ind., 2nd Ed., 216 (under I. trifoliate); S. Arjun<br>Bomb. Drugs, 41; Drurv, U. Pl., 276; Lisboa, U. Pl. Bomb., 197<br>B <sup>*</sup> mt>'Ga*; XV., 431, rf./y. P. Gag., /., 80; Balfour, Cyclop., 367<br>Habitat An annual with elongated slender branches, found on the<br>plains of the Western Ponjacula and Rundellkhond                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MEDICINE.                           | Medicine.—The SEEDS of this species, as also of I. trifoliata, are sai                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Seeds.<br>132<br>FOOD.<br>Seeds.    | Food—The natives make flour of the SEBDS, and when baked int<br>bread use the flour as an article of diet in times of scarcity. The seeq                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 133                                 | were extensively employed in that manner during the Bombay famine «                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                     | 1877-78. Lisboa regards them as highly nitrogenous.<br>L. linifolia. <i>Ratz.: iFl. iBr. init itt OP: Wight. ic. t.</i> 3'3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                     | <ul> <li>I. linifolin, Ratz., <i>jffl. Br. Ind., III., 92;</i> Wight, Ic, t. 3'3-<br/><sup>VAB</sup><sup>WIGHT</sup> <sup>III</sup> <sup>4</sup> <sup>w</sup> <sup>HIND</sup><sup>**</sup> Bhangra, BENG. ; Tandi khodebaha<sup>A</sup>AVj<sup>A</sup>L<sup>IA</sup><br/>PB.; Burburra, pandkari pale, bhangra, torki, BOMB.; Pandht, WAS<br/>yawanch malmandi, KALADGI, BOMB.<br/><sup>III</sup> <sup>···</sup> <sup>··</sup> <sup>··</sup> <sup>II</sup> <sup>C</sup> <sup>III</sup> <sup>III</sup> <sup>···</sup> <sup>····</sup> <sup>···</sup> <sup>····</sup> <sup>····</sup> <sup>···</sup> <sup>····</sup> <sup>···</sup> <sup>···</sup> <sup>····</sup> <sup>···</sup> <sup>····</sup> <sup>····</sup> <sup>···</sup> <sup>···</sup> <sup>···</sup> <sup>····</sup> <sup>·····</sup> <sup>····</sup> <sup>·····</sup> <sup>····</sup> <sup>·····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>·····</sup> <sup>·····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>·····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>·····</sup> <sup>····</sup> <sup>····</sup> <sup>····</sup> <sup>·····</sup> <sup>······</sup> <sup>······</sup> <sup>······</sup> <sup>······</sup> <sup>······</sup> <sup>······</sup> <sup>······</sup> <sup>·······</sup> <sup>········</sup></li></ul> |
| MEDICINE.                           | Cewlon; ascending the Himdlaya and distributed to Abyssinia, Atgn«*»<br>istan, &c.<br>Medicine.—It is given medicinally in febrile eruptions. The Rev. A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 135<br>FOOD.                        | Carnpbell says that the Santals use the plant in amenorrhoea along with Euphorbia thymifolia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Seeds.<br>136                       | r f $^{\circ \circ \circ d}$ T $^{1'he SEEDS were}$ largely consumed during the Deccan <sup>6</sup> famile<br>of 1877-78, by the people of Kaladgi, Dharwar, Sholapur, Ahmednaga<br>&c, though they are unpleasant to the taste. After being ground to now                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 137                                 | <ul> <li>they were, either alone, or mixed with cereals, made into cakes. Dr. L.y<sup>on</sup> analysis proves the uncultivated pulse to be rich in nitrogen.</li> <li>action paucifolia, ZW*7*/ Fl. Br. Ind., II., 97; Wight, Ic^t. 33*-</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                     | <ul> <li>Syn.~I. ARGENTEA, Roxb. ; I. HETEROPHYLLA, Roxb. mSS.</li> <li>vern.—Kuttukkdrckammatti, TAM. (from Kuttukkal, an upright post, chammatti, a smith's hammer).</li> <li>References.—Roxb., FL Ind., Ed. C. 363 : Dals. &amp; Gibs., Bomb. F. 50; Murray, PL and Drugs of Sind, 116; Gas., NW. P., I., 80; 14 '#*:-&gt;, Bhandara Settle, Rept., 26; Madras, Man. Aan***, II., 13, district Man., Coimbatore, 241; Sydapet Ex. Farm Man. and Guide</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                     | Hibitate unite on Merwara, n.<br>LT«cl.~ ^a'' ~ A. Sh1? b * tO 6 fCet hi &h, fOUfld in the P, laillS of Sifl d and the<br>Tropic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| ·                                   | Af <sup>p</sup> rFca, andlava. ^^ <sup>Distributed</sup> ''> Baluchistan, Arabia,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | {G. Watt.) INI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DIGOFERA<br>nctoria.                                                    |
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| Medicine.—Mr. Maclean writes that it is considered<br>poisons of all kinds. The ROOT boiled in milk is used as<br>a decoction of the STEM as a gargle in mercurial salivation<br>Fodder.—Sheep are fond of this plant, and it grows fre<br>est soils. It has been experimentally cultivated at the<br>Madras, with satisfactory results. The opinion has been<br>Manual and Guide to the Farm that it may possibly become<br>Manure?—It is extensively employed as a manure fo<br>South India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | an antidote to<br>a purgative and<br>n.<br>eely on the poor-<br>Sydapet Farm,<br>expressed in the<br>e a valuable crop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MEDICINE.<br>Root & Stem*<br>138<br>FODDER.<br>139<br>MANURE.<br>140    |
| 'ndigofera pulchella, Roxb.; Fl. Br. Ind., II, tot;<br>Syn.—I. PURPURESCENS, Roxb.; I. CASSIOIDES, Rota                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 141                                                                     |
| Jtoxb.; I. VIOLACKA, Roxb.; I. ARBOREA, Roxb.<br>Vern.Sakena, hakna, HIND.; Uterr, jhurhur, KOL.<br>bichi, SANTAL; Hikpi, LEPCHA; Jirhul, KHARWAM<br>Togri, BHIL: Taw maiyain or tawmeyiang, BURM.<br>References.—Roxb.,FI. 1nd., Ed. C.B.C., 5#5> S56;<br>Cal., 212; Brandis, For. FL, 136, Kurz, FI. Burnt,<br>For. Man., 8s; Gamble, Man. Timb, 117; Dalz. & G.<br>Aitchison, Cat. Pb. and Sind PL, 41; Kurz, Pre<br>Pegu, App. C. v.; Grak. Cat. Bomb PL, 44; Kurz, Pre<br>Pegu, App. C. v.; Grak. Cat. Bomb PL, 46; Rev. A<br>Eton. Prod. Chutia Nagpur, Nos. 8480, 9234; Atki<br>308, 340, 472; Drury, U. PL, 280; Gaz. Bomb, XV.,<br>P., J., 80; IV., Ixx; Gaz, Simla, 12; For. Admn<br>Nagpur, 1885-86, 29; Jour. AgriHort. Soc. (Set.), VI<br>Habitat.—A large shrub, 4 to 6 feet high, found throug<br>layan tract and hills of India, ascending to 5,000 feet.<br>it as not unfrequent in the dry and open, especially in the<br>Ava and Prome down to Pegu and Martaban.<br>Medicine.—A decoction of the ROOT is given by the Sa<br>and a powder of the same is applied externally for pains i<br>Food.—Its pink FLOWERS are sometimes eaten in Ce<br>also in Chutia Nagpur, as a vegetable.<br>Structure of the Wood.—Similar to that of I. Gerardiana,<br>I. tinctoria,Linn.; Fl. Br. Ind., II, 99; Wight, Ic,<br>THE INDIGO PLANT OF COMMERCE.<br>Vern.—Nil (nilpatie, the plant, andm/mal, the dye stuff<br>Nil (basma, e.g., the leaves, as a medicine), PB.; W<br>BHOTE; Osma (the leaves), SANS.; Nilaj, ARAB.; Nil, nil,<br>(e.g., that which dyes), SANS.; Nilaj, ARAB.; Nil, nil,<br>(e.g., that which dyes), SANS.; Nilaj, ARAB.; Nil, nil,<br>(e.g., that which dyes), SANS.; Nilaj, ARAB.; Nil, nil,<br>Ma'Jon, Burma and Its People, 510, 532, 776 / Kurz,<br>Soc, XLV, 1876, 269, also Kurz, Prelim. For. Rept. I<br>Pharm, Ind., 333, 396 (Ainslie, Mat. Ind., I., 179; JL,<br>Ma'Jon, Burma and Its People, 510, 532, 776 / Kurz,<br>Soc, XLV, 1876, 269, also Kurz, Prelim. For. Rept. I<br>Pharm, Ind., 333, 396 (Ainslie, Mat. Ind., 1., 179; JL,<br>Ma'Jon, Burma and Its People, 510, 532, 776 / Kurz,<br>Soc, XLV, 1876, 269, also Kurz, Prelim. For. Rept. I<br>Pharm, Ind., 333, 396 (Ainslie, Mat. Ind., 1. | K; Baroli, MAR.;<br>Voigt, Hott. Sub.<br>I., 361; Beddome,<br>jibs., Bomb. Fl.,60;<br>elim. For. Report,<br>A. Campbell, Rept.,<br>inson, Him. Dist.,<br>A: 7 Gaz., NW.<br>n. Report, Chutia<br>III., 155.<br>ghout the Hima-<br>Kurz mentions<br>e In, forests from<br>antals for cough,<br>in the chest.<br>entral India and<br>h, var. heterantha.<br>t. $36$<br>S.<br>(), HIND., BENG. J<br>asma (the leaves),<br>SIND ; Nila, guli,<br>SIND ; Nila, guli,<br>AW.; Nili-mandu,<br>nat, BURM.; NJI,<br>grdmind, ranjani<br>ah, PERS.<br>t., Hort. Sub. Cal.,<br>Man., 8\$; Gamble,<br>Iz., & Gibs., Bomb.<br>and Sind PL, 41;<br>J., 64; XX., 404;<br>Z., in Jour. Asiatic<br>Pegu, App. C, v.;<br>,33, 74;O'Shaugh-<br>Pharm. Ind., 94,<br>Med. W. Ind 2nd<br>im. Med. PL, 72<br>Paris Exh., in ',<br>Paris Exh., in ',<br>Paris Exh., in ',<br>Stable, IA'S; Irvine,<br>inschoten, I., 62-<br><b>N</b> , 58, 67, 107, 116. | MEDICINE.<br>Root.<br>142<br>FOOD.<br>Flyng:s.<br>TIMBER.<br>144<br>145 |

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Dist., 308 ; Drury, | I. 145 **INDIGOFERA** 

The Indigo Plant of Commerce.

| tinctorio                               | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DYE.<br>Leaves.<br>146<br>OIL<br>Seeds. | <ul> <li>U. PL. 254, 473; Duthie &amp; Fuller, Field and Garden Crops, A; <i>I</i><sup>thood</sup>, U. PL, Bomb, 242; Birdwood, Bomb, Pr. 297; Royle, T. Tans, Bort, 26; Attanson, Dyes and Tans, I; McCann, Dyes are. Tans, Bort, 26; Jan, Liotard, Dyes, 6t or 100; Groothe, Dyeing, 48 to 490; Mardie Dye Report, 18; Hummel, Jlyemg 'cr' leitur 'rao., '276', dif Hade Manuf, Industries, Dyeing, 141; Needham, KampH Dyes, 'S', 'Full4e, Ram, Report on Indian, Dyes, T. Shart', P. Friss, Essat, on the marty in Hubborhistic Magazine, Aug/2525, Tai J, 'and', 'barney', 'the Report on Indian, Dyes, 'the Shart', P. Friss, Essat, on the marty in Hubborhistic Magazine, Aug/2525, Tai J, 'and', 'barney', 'the Resonance', 37, 52-94, 1990, 2012, Kew Repts, 1500, 107 annuary, 'the Tai Resonance', 37, 52-94, 1990, 2012, Kew Repts, 1500, 107 annuary, 'the Tai Resonance', 37, 52-94, 1990, 2012, Kew Repts, 1500, 107 annuary, 'the Tai Resonance', 37, 52-94, 1990, 2012, Kew Repts, 1500, 107 annuary, 'the Tai Resonance', 37, 52-94, 1990, 2012, Kew Repts, 1991, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1992, 1</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| ŌIL                                     | <b>Dye.</b> —The infusion of the LEAVES of this species, as also TM below.<br>yields the Indigo of commerce. See the special article on INDIGO<br><b>Oil.</b> —The SEEDS are said to yield an oil which is used medicinal, ers<br>Medicine.—The EXTRACT is given in epilepsy and nervous $a^{is}jf_{rel}$ .<br>It is also used in bronchitis and as an ointment in sores. It is 5<br>employed as a test reagent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| · I48<br>Leaves.<br>149                 | SPECIAL OPINIONS.—§ The following communications, as <sup>a</sup> ^ u <sub>se</sub><br>from many other similar medical opinions, may be here give. <sup>1</sup> : <sup>1</sup> Surgeo<br>by native practitioners in chronic affections of the brain " (Cwi poultion<br>y. Anderson, M.B., Bijnor, North-Western Provinces). <sup>(A)</sup> flo<br>Bradenof the LEAVES and applied to the perinaeum is said puscelles Sarun<br>"A chief remedy for mineral poison" (V. Unmegudien Mettapollian<br>Madran) <sup>(I)</sup> I how manipulation <sup>(I)</sup> Surgeon <sup></sup> |
| 1                                       | Madras). "I have used it frequently for sores on horses; it is sul<br>1. 149                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| posed to promote the growth of hair" ( <i>Surgeon-Major C. W. Calthrop,</i><br><i>M.D., Morar)*</i> "It is used as an external application in the form of<br>paint over the abdomen in cases of tympanites and retention of urine. In<br>the form of paint or ointment it is largely used in sores and diseases of<br><b>cattle</b> " ( <i>Civil Surgeon J. H. Thornton, B.A., M.B., Monghyr).</i> "Indi-<br>go is used by natives as a cooling application to burns and sores of horses"<br>( <i>Assistant Surgeon Bhagwan Dass, Civil Hospital, Rawalpindi, Panjdb).</i><br>"An infusio*n of the ROOT is given as an antidote in cases of poisoning<br>by arsenic" ( <i>Surgeon W. F. Thomas, Madras Army, 33rd Regiment,</i><br><i>M. N. /., Man galore).</i> "Used as a medicine as well as a dye " ( <i>Surgeon-<br/>Major J. E. T. Aitchison, CI.E.</i> )<br><b>INDIGO.</b><br>HISTORY.<br>The chief source of the Indigo of Commerce is the Indigofera distin-<br>guished as tinctoria. The origin of that species is involved in the greatest<br>obscurity. Early botanists recorded having found it wild in India, Africa,<br>and Arabia; but it is now admitted that the form they referred to was<br>Indigofera cerulea—a plant by some writers viewed as the original wild<br>condition from which was derived through cultivation the modern indigo-<br>yielding stock. By others these plants are regarded as distinct. There<br>are in all some 300 species of Indigofera, distributed throughout the tropical<br>regions of the globe, with Africa as their head-quarters. India possesses<br>some 40 species, but with reference to Indigofera tinctoria there is no<br>authentic record of its haying been found far removed from human in-<br>fluence, still less of its having been observed in what could be viewed as an<br>indigenous habitat. It may perhaps be desirable to review here the chief<br>botanical opinions on this point. Bent ley and Trimen, following the view<br>once generally maintained, say, it is a native of the west coast of Africa,<br>where it is also extensively cultivated. But De Candolle's Indigofera<br>inctorial <i>var.</i> macrocarpa (upon which that opinion probably depended) is<br>now regarded as I. cccru | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                              | INDIGOFERA                                           |
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| <ul> <li><i>M.D., Morar</i>)* "It is used as an external application in the form of paint over the abdomen in cases of tympanites and retention of urine. In the form of paint or ointment it is largely used in sores and diseases of cattle" (<i>Civil Surgeon J. H. Thornton, B.A., M.B., Monghyr</i>). "Indigo is used by natives as a cooling application to burns and sores of horses" (<i>Assistant Surgeon Bhagwan Dass, Civil Hospital, Rawalpindi, Panjdb</i>). "An infusio*n of the ROOT is given as an antidote in cases of poisoning by arsenic" (<i>Surgeon W. F. Thomas, Madras Army, 33rd Regiment, M. N. /., Man galore</i>). "Used as a medicine as well as a dye " (<i>Surgeon Major J. E. T. Aitchison, CI.E.</i>)</li> <li><b>INDIGO.</b></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (0. //)                                                                                                                                                                                                                                                                                                                                                                                 |                                                      |
| HISTORY.<br>The chief source of the Indigo of Commerce is the Indigofera distin-<br>guished as tinctoria. The origin of that species is involved in the greatests<br>obscurity. Early botanists recorded having found it wild in India, Africa,<br>and Arabia; but it is now admitted that the form they referred to was<br>Indigofera ccerulea—a plant by some writers viewed as the original wild<br>condition from which was derived through cultivation the modern indigo-<br>yielding stock. By others these plants are regarded as distinct. There<br>are in all some 300 species of Indigofera, distributed throughout the tropical<br>regions of the globe, with Africa as their head-quarters. India possesses<br>some 40 species, but with reference to Indigofera tinctoria there is no<br>authentic record of its having been observed in what could be viewed as an<br>indigenous habitat. It may perhaps be desirable to review here the chief<br>botanical opinions on this point. Bent ley and Trimen, following the view<br>once generally maintained, say, it is a native of the west coast of Africa,<br>where it is also extensively cultivated. But De Candolle's Indigofera<br>tinctorial <i>var</i> . macrocarpa (upon which that opinion probably depended) is<br>now regarded as I. ccerulea. Boissier ( <i>Flora Orient.</i> ) describes nime<br>species of Indigofera as met with in Central Asia, Arabia, and Egypt; but<br>he makes only an accidental allusion to Indigofera tinctoria as met with<br>under cultivation. In the recent enumeration of the plants of China by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <i>M.D., Morar)*</i> "It is used as an external application<br>paint over the abdomen in cases of tympanites and reten<br>the form of paint or ointment it is largely used in sore<br><b>cattle''</b> ( <i>Civil Surgeon J. H. Thornton, B.A., M.B., M</i><br>go is used by natives as a cooling application to burns and<br>( <i>Assistant Surgeon Bhagwan Dass, Civil Hospital, Raw</i><br>"An infusio*n of the ROOT is given as an antidote in c<br>by arsenic'' { <i>Surgeon W. F. Thomas, Madras Army,</i><br><i>M. N. /., Man galore).</i> "Used as a medicine as well as a<br><i>Major J. E. T. Aitchison, CI.E.</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | n in the form<br>tion of urine.<br>es and diseases<br><i>(onghyr)</i> . "Ind<br>sores of horse<br><i>valpindi, Panjd</i>                                                                                                                                                                                                                                                                | of<br>In<br>of<br><b>li-</b><br>s "<br>b). Boot      |
| The chief source of the Indigo of Commerce is the Indigofera distinguished as tinctoria. The origin of that species is involved in the greatest obscurity. Early botanists recorded having found it wild in India, Africa, and Arabia; but it is now admitted that the form they referred to was Indigofera ccerulea—a plant by some writers viewed as the original wild condition from which was derived through cultivation the modern indigovielding stock. By others these plants are regarded as distinct. There are in all some 300 species of Indigofera, distributed throughout the tropical regions of the globe, with Africa as their head-quarters. India possesses some 40 species, but with reference to Indigofera tinctoria there is no authentic record of its having been found far removed from human influence, still less of its having been observed in what could be viewed as an indigenous habitat. It may perhaps be desirable to review here the chief botanical opinions on this point. Bent ley and Trimen, following the view once generally maintained, say, it is a native of the west coast of Africa, where it is also extensively cultivated. But De Candolle's Indigofera tinctorial <i>var</i> . macrocarpa (upon which that opinion probably depended) is now regarded as I. ccerulea. Boissier ( <i>Flora Orient.</i> ) describes nine species of Indigofera as met with in Central Asia, Arabia, and Egypt; but he makes only an accidental allusion to Indigofera tinctoria as met with under cultivation. In the recent enumeration of the plants of China by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | •                                                                                                                                                                                                                                                                                                                                                                                       |                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The chief source of the Indigo of Commerce is the guished as tinctoria. The origin of that species is involve obscurity. Early botanists recorded having found it wild and Arabia; but it is now admitted that the form they Indigofera ccerulea—a plant by some writers viewed as condition from which was derived through cultivation the yielding stock. By others these plants are regarded a are in all some 300 species of Indigofera, distributed throur regions of the globe, with Africa as their head-quarters some 40 species, but with reference to Indigofera tinc authentic record of its having been found far removed fluence, still less of its having been observed in what coul indigenous habitat. It may perhaps be desirable to rev botanical opinions on this point. Bent ley and Trimen, the once generally maintained, say, it is a native of the west where it is also extensively cultivated. But De Canot tinctorial <i>var</i> . macrocarpa (upon which that opinion probanow regarded as I. ccerulea. Boissier ( <i>Flora Orien</i> , species of Indigofera as met with in Central Asia, Arabia he makes only an accidental allusion to Indigofera tinc | red in the great<br>d in India, Afri<br>y referred to w<br>s the original w<br>e modern indi<br>as distinct. The<br>ighout the tropi<br>s. India posses<br>ctoria there is<br>from human<br>d be viewed as<br>iew here the che<br>following the vi<br>st coast of Afri<br>dolle's Indigof<br>ably depended)<br>t.) describes n<br>a, and Egypt; we<br>toria as met we<br>lants of China | 151<br>151<br>151<br>151<br>151<br>151<br>151<br>151 |

# **INDIGOFERA**

\_\_tinctoria\_\_

HISTORY.

Application of Nil].

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likely that their so-called "apparently wild" plant was one of the forms of L coerulea—these botanists thus making the same mistake that De Candolle did regarding Western Africa. Kurz speaks of I. tinctoria as frequently cultivated on the alluvium of the Irrawadi in Burma; but he incorrectly <sup>re. fe 5 s</sup> I. ccerulea, *Roxb.*, to be a synonym of I. Anil. The plant he deals with, he says, occurs all over Burma from Ava to Martaban and Tenassenm. And significantly he adds that he could not find \*ny sufficient grounds for separating specifically the two forms. Kurz was far too accurate a botanist to make such a statement without sufficient reasons, and it may safely be concluded that I. tinctoria and I. ccerulea are very easily confused one with the other, and that the popular Indian writers, who speak of the Indigo plant being wild in India, allude to I. ccerulea and not to either I. tinctoria or I. Anil.

There is thus no botanical evidence that Indigofera tinctoria is indigent.<sup>011</sup>?. i?, I<sup>m</sup><sup>dia</sup>; DeOandolle, however, lays stress on the fact, that it is the *Nth* of Sanskrit authors, from which circumstance he concludes that it must be of Asiatic origin. On the other hand, it may with equal force be urged that had it been a native plant of India, like the truly indigenous Indigoferas, it would have had its specific names in most of the languages and dialects of this country, more especially among the aboriginal races. The singular uniformity with which the word Nild is associated both with the plant and the dye argues a common origin in a centre from which the knowledge of so valuable a product was diffused-its name passing from tongue to tongue with the gift of a few seeds. According to Mitchison and other travellers, Isatis tinctoria—the woad—is the source of the Indigo prepared in Upper Asia, a region where Indigofera t does not apparently exist. The Sanskrit people may have accordingly therefore just possible that their *Mila*, of the earlier epochs, <sup>mav</sup>, **Fve**<sub>f</sub> the the woad which with the ancient Britons was used, like the **\***<sup>1</sup>\*\*\*\*</sup>, j<sub>t as</sub> American Indians, to dye the skin and hair. Complex and di<sup>FMed</sup> the the A the art of dyeing with Indigo is.it is more intimately sssociatea with early human race than any other dye or pigment. But in \*ndianonger the most striking features of the use of a blue dye is the large n `•fl of plants which are not only known to afford such a dye, b ut "hich are icit". day are regularly so employed in place of the modern commercia<sup>1</sup>.\* And it may be added that every source of blue dye (chemically "J" has its special and peculiar names in the regions where it is 10t no utilised. These blue-dye plants are purely indigenous, and were prob bly the sources of the blue-dye of India long prior to a knowledge in1/\*ila. (The reader is referred to the paragraph on Indigo Substitutes, for further information on this point\* see page 449.) r(j *tftfa* 

But there are other considerations of equal weight. The wo terss simply denotes dark blue colour, and is, with many of the early writh practically synonymous with kdla (black). Adjectively it is  $^{a} ? ^{p}$  is the simple of practically synonymous with kdla (black). Adjectively it is  $^{a} ? ^{p}$  is the simple of the number of the practically synonymous with kdla (black). Adjectively it is  $^{a} ? ^{p}$  is the simple of practically synonymous with kdla (black). Adjectively it is  $^{a} ? ^{p}$  is the simple of the number of the practically synonymous with kdla (black). Adjectively it is  $^{a} ? ^{p}$  is the simple of the number of numbers speak of nila flies, birds, cows (e.g. nflgao, the blue-bull or tax pictus of Zoologists); of blue stones (m'lopala, the Lapis  $^{azui}$  V (ind nilamani, nilaratna, the Sapphire); of blue flowers, rivers, seas, n is, and clouds (nilabha). Nila, nil, nel. is associated with a 1 a  $^{a}$  is plants besides indigorea. Thus we have the blue water-lily Nympnfe Lotus), in Arabic the nilufar, from which we derive the generic.  $^{n} i^{m} f_{fif1}$  a small group of water-lilies, Nuphar. So, again, we have it in the D<sup>0</sup> AJ' cal name for the sacred Lotus—Nelumbium ; and in botanical nomenclature and oriental literature we have the Pharbitis Nil or nabbun-nti or Arabic, tukhme-nil of Persian, and \*// kolomi of Bengal. A curious I. 153

#### **INDIGOFERA** The Indigo Plant of Commerce. (G. Watt) tinctoria. HISTORY. instance (having perhaps a special significance in connection with Indigo since one species is actually used along with indigo) exists in the fact that some of the species of Senna bear as a prefix to their specific names, the syllable nil. But nila carries with it also the abstract meaning of darkness. Mid substantively is the plant which yields a blue or darkcoloured dye. Thus in its range of meanings it passes from the general to the specific, and probably obtained its restricted signification of the blue dyef>orti Indigofera in India, and that too perhaps only during comparatively modern times. In addition to the fact that there are no specific primitive names in the languages of India for Indigofera tinctoria, such as exist for the other species of the genus, there are in some of the languages or dialects descriptive and comparative names for it that would seem to indicate a previous knowledge in other blue uyes. A nus in ....... rese it is ollenili (olle, good) : again, hennunili (female indigo) : in Tamil, aviri (avi, boiled), and karundóshi (black indigo): so also even in Sanskrit out of a long list of descriptive names, besides nild, it is vajranili (hard blue). Even the Gujarati name gait may simply mean " the decoction,' and thus indicate the method of preparation. In part support of this contention for a comparatively modern application of *Nild* specifically, we have the further fact that Indigo did not, except in Portuguese and during the sixteenth century, carry with it to Europe the name Nild. That an indigo or blue dye was used in remote times there can be no doubt since it has been detected in the coloured borders of some of the Egyptian mummy garments, but that the word *Nild* is of alike antiquity, or that the mummy dye was prepared from Indigofera tinctoria are problems that perhaps can never be solved. Dioscorides (A.D. 60) speaks of Indigo as'lvliKov, Pliny calls it Indicutn; and in the Periplus it is 'IVILKOV ptkav or the Indian Black, exported from Barbaricon on the Indus. The word "black" is instructive both from its association with Nild, and from the circumstance that the dye was used as a black colour before its property of affording blue was discovered. In the thirteenth century Marco Polo recorded having seen it at Colium (an ancient port in the Native State of Travancore) where he says, "they also have abundance of a very fine indigo (ynde)." John Huyghen van Linschoten, whose journal of Indian Early mentravel was published in 1596, very carefully describes the manufacture of tion or Indigo in India. what he speaks of as \*' Annil or Indigo, by the Guzuratis called Gait, by others *Nil.''* 154 Conte in the fifteenth century, and Tavernier in the seventeenth, also minutely describe the manufacture of Indigo. Up to the time when the discoveries of the fifteenth century established the new commercial route to India, Indigo reached Europe by the Persian Gulf and Alexandria. In the commercial reports of Marseilles as early asA.D. 1228, it is described as the Indigo of Bagdad. But when first brought into Europe it was used only in small quantities to heighten and deepen the blue colour obtained from woad-a dye which, for several centuries, was the object of an important cultivation and manufacture in Germany, France, Prussia, Italy, and England. Towards the end of the sixteenth century, however, the European dyers had begun to recognise that Indigo afforded the means of a great economy, and that the dye was at the same time of a superior quality. At this period the dyers of Holland were the most famous and prosperous in all Europe. Even down to the beginning of the seventeenth century the English manufacturers sent their white cloths to be dyed in Holland: hence known as Hollands. From this trade the fortunes of the great Dutch capitalists were made; but difficulties with Portugal led to; the Dutch making an effort to procure their supplies direct, instead of through the Portuguese merchants. For nearly a century Lisbon rivalled even Venice as a dep6t for Eastern produce; but

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| INDIGOFER<br>tinctoria.                                                                    | The many Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HISTORY.                                                                                   | the skill of the Portuguese stopped short of utilising in home industries                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Woad<br>cultivation<br>of Europe.<br>155<br>Early trade<br>In indigo<br>from India.<br>156 | the skill of their maritime enterprise brought to their shores, hence their Indian Indigo found its way first to Holland, thence over an Europe. But in 1631 the Dutch East India Company was formed, at enough Indigo was brought direct to Holland to supply the whole £ " i' and an immense Dutch trade was created at the -expense of the ror-guese. The envy of the merchants of all Europe was thereby <b>profiles</b> , fuguese. The envy of the merchants of all Europe was thereby <b>profiles</b> , fuguese. The envy of the merchants of all Europe was thereby <b>profiles</b> , fuguese. The envy of the merchants of all Europe was thereby <b>profiles</b> , for their fortunes on the cultivation of the indigenous dye, and eyen the guarantee for a considerable portion of the ransom of King Franks, 1, was to be met from that induxy. Indigo was accordingly interdicted in the cultivativative. In Gormany, m <sup>8</sup> to only the solution of the indigenous dye, and eyen the guarantee for a considerable portion of the ransom of King Franks, 1, was to only the solution of the indigenous dye, and eyen the guarantee for a considerable portion of the ransom of King Franks, 1, was to out (1598), and Henry IV. issued an edict in 1609 sentencing to a fill any person who should be found using the dye. In Germany, m <sup>8</sup> timanter, stringent measures were taken to stille the growth of a trade in Indigo, for the wealthy woad merchants there enjoyed the proud distingtion of the "Waid Herrn"—the gentlemen of woad. The EmperofRugae, in 1607, and the Elector of Saxe in 1650, prohibited its use. <i>Juin</i> withstanding all efforts to suppress indigo, woad plantations and rac <b>origon</b> and bruis globe dyed in Holland. The privilege was "Trada" and Bruish goods once more were sent to Holland to be dyed, with any of the evaluation of the searce who were profile in the interst of the public. "Trada" and Bruish goods once more were sent to Holland to be dyed, with the and therefore be interdicted in the interests of the public. "Trada" and an estimation in 1581, the searce of the greater |
|                                                                                            | 1. 156                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| The Indigo Plant of Commerce. (£. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NDIGOFERA<br>tinctoria.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| the name Indigo. The writer is thus disposed to regard Indigo (so f<br>as India is concerned) as having been first manufactured in Weste<br>India—Gujarat or Sind being its home—a region where it is now rarely,<br>at all prepared, but where it still bears its vernacular name, <i>gait</i> . The Po<br>sian and African influences (especially in the dyeing and weaving indu-<br>tries) are so strong on the Western side of India as to give countenar<br>to the idea of Indigo-growing and manufacture having been introduced<br>an idea almost confirmed by the rapidity and completeness of its migrati<br>to other tracts of India subsequently found better suited. Indeed, it m<br>be suggested that an indigenous industry would almost naturally<br>expected to have survived with greater pertinacity than indigo has man<br>fested.<br>A\out the middle of the eighteenth century, the injunctions against four<br>use of Indigo were in most European countries removed, though in Niire<br>burg the dyers were required, so late as the end of that century, to take<br>oath that they would not use it. Gradually the knowledge of the d<br>extended, and it may safely be said that, though attempts have be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ar<br>HISTORY.<br>rn<br>if<br>er-<br>is-<br>is-<br>ce<br>on<br>ay<br>be<br>ni-<br>he<br>m-<br>an<br>ye                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| extended, and it may safely be said that, though attempts have be<br>made to discover a substitute, all have failed, and at the present d<br>Indigo is perhaps the world's most important tinctorial re-agent.<br>Two influences, however, early began to militate against the Indi<br>market—the discovery of a source of the dye in America, and the adulte<br>tion practised by the native manufacturers. The high price paid for 1<br>article gave birth to a wholesale system of adulteration, while at the sa<br>time the dye had become indispensable. The colonists, French, Spani<br>Portuguese, and English, accordingly took to Indigo cultivation. Eu<br>pean skill and capital soon placed the enterprise on a footing which kill<br>or all but killed, the Indian trade. The British West Indian colonists, he<br>ever, soon found that coffee, sugar, and other products were more remune<br>tive ; and at the same time the severance of America from Great British<br>left the British dyers at the mercy of foreign countries for their supplies<br>Indigo. According to some authorities, the first efforts to revive an Indi<br>Indigo industry proceeded from a small French factory established m<br>the French settlement of Chandernagore on the Hugli, a few miles for<br>Calcutta. But if the idea had been thus actually entertained, very lit<br>was done until the Directors of the East India Company, seeing the pr<br>pect of renewing their Indigo transactions and at the same time of savi<br>the British manufacturers from dependence on French and Spanish co<br>nists, resolved to take active steps towards starting Indigo cultivation<br>Bengal. European Indigo planters were brought from the West Indies a<br>established in selected districts of Bengal. The Company's officers wa<br>wermitted to trade in the article, and home remittances were made<br>Indigo for a series of years, even although this resulted in heavy loss<br>It was early seen to be unnecessary for the Company to directly or<br>factories. Many gentlemen were found willing to undertake the respo-<br>sibility upon obtaining grants of land on favourable leases, the Compa<br>purchasi | ay<br>an<br>ra-<br>he<br>me<br>sh,<br>ro-<br>ed,<br>ww-<br>ra-<br>nin<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>of<br>an<br>ear<br>an<br>ear<br>of<br>an<br>ear<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an<br>an |

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| HISTORY.                                    | these losses every encouragement was given to improve and cheapen the pro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ndigo purely<br>a European<br>trade.<br>158 | cess of manufacture, and the Company continued to subsidise the industry until the quality of, first the French and then the Spanish Indigo, had beer supassed by the Indian. In 1787 Dr. Hove visited Western India, and it his Journal he describes an Indigo industry on a scale that there no longe exists. Thus the establishment of the *Bengal Indigo trade may be viewed as having given the final blow to the extinction of the Bombay cultivation. Even so late as 1820, Indigo was a fairly important crop in Gujarat, and the number of unused pits near old villages and among the buried cities of the Satpuda mountains bear testimony to the abandoned industry. Early, however, we read that the natives of Upper India had even taken to producing large quantities. The good name earned through the European still and care in manufacture thus began to be injured by the inferiority of the Native stuff that found its way to Europeal along with the highly-prized East Indian European-made, article. The success of the new industry soon also created another danger. European factories multiplied until alarm was felt that the markets were being glutted. The bast India Company then felt called upon to restrict the traffic, especially from territories outside their own possessions. Accordingly in a despatch dated August 1800 we read:—« European skill and enterprise have formed the present indigo manufacture and indigo trade of India. To these both Oudh and Bengal are indebted for the share they possess in the exports of that article, and on these, there seems reason to believe the trade in both countries will continue to depend. A trade thus raised and supported greatly to the benefit of those countries, by persons not natives of 5 m to both countries will continue to depend. A trade thus raised and supported greatly to the benefit of those countries, by persons not natives formed the present Suff and in the receive of the state at a considerable expense—such a trade the Bengal." "In whatever degree, also, the indigo trade of Oudh is ca |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | DIGOFERA<br>nctoria.                               |
| 1802) the East India Company directly supported the indigo industry,<br>and placed India once more in the foremost rank among the indigo-pro-<br>ducing countries of the world. When pecuniary aid was no further neces-<br>sary, the Company retired from direct ownership of indigo-factories.<br>They, however, continued to make large purchases and to trade in<br>indigo. In 1806 they directed a mart to be established in Calcutta<br>for ready-money purchases in indigo, and they consigned to India test<br>samples' valued by the home brokers "for the purpose of assisting the<br>judgment of our servants in making their purchases." It was, however,<br>subsequently found necessary to make certain money advances to manu-<br>facturers from whom the Company proposed to purchase the dye, so that<br>a certain amount of encouragement was continued, though direct support<br>and Supervision were discontinued. It may be of use to quote here the<br>specification of qualities and prices which in 1810 were sent to India :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | HISTORY.                                           |
| A. Blue worth per ftIoB. Purpledo.C. Violetdo.D. Copperdo.The despatch forwarding these valuations gives the results of salesfor 1807 to 1809:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    |
| ft       5.       d.         March sale,       1807       2,022,113       @ an average of .       .       8       6         September ,,       3,091,202       @ do.       .       .       6       6         March ,,       1808       2,652,428       @ do.       .       .       5       6         March ,,       1808       2,652,428       @ do.       .       .       5       6         March ,,       1809       3,995,191       @ an average of .       .       .       4       7         Ditto Company's ,,       280,502       @ do.       .       .       5       6         September sale ,,       371.370       @ do.       .       .       4       6         Ditto Company's ,,       98,894       @ do.       .       .       5       11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Valuation of<br>Indigo In<br>1810.<br>159          |
| •'The general average of all which is 55. <i>lid.</i> per pound; and as the above term comprises a period when the markets were favourable as well as one in which they were adverse, it may be considered as a fair general average.'' In a ''Statement of Advances on the Remittance Plan '' the Company is shown to have advanced from 1786 to 1804 close on a million pounds sterling towards their purchases.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | •                                                  |
| Even at this early stage of the new Anglo-Indian Indigo industry,<br>however,*-an industry directly fostered by the Government and in which<br>many of its officers traded extensively, or resigned the Company's service<br>to become Indigo planters—difficulties had arisen through the competi-<br>tion of rival concerns. The planters desired that the Company should<br>prohibit the establishment of new factories within certain limited distances<br>of those already in existence. The Directors replied that "since the in-<br>conveniences of which they complain may also have contributed to the<br>repeated calls made on the Company to relieve the distresses under which<br>this branch of manufacture laboured, we are the more disposed to wish<br>that ne.V enterprises may be undertaken with prudence, and that the<br>cultivators may avoid collisions by friendly correspondence among them-<br>selves, and by mutually restraining their servants from issuing advances<br>to those rayats who may be under previous engagements." The system of<br>advances made by the Company to the owners of factories against annual<br>purchases was thus not only fully established, but that principle was<br>recognised as applicable to the owners of factories in their dealings with<br>the rayats or actual cultivators. At the same time the Company seem<br>to have appreciated the advantages that would likely accrue from the<br>establishment of native manufacturers. In a despatch dated April 1811<br>we accordingly read:—" It is expedient that your attention should be | Difficulties<br>due to over-<br>production.<br>160 |

I. 160

| INDIGOFERA                                                         | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HISTORY.                                                           | directed to the encouragement of the native growers of indigo being proprietors of factories, by issuing advances to them in common with European manufacturers, taking care that the security be sufficiently respectable; as we fully concur in the opinion of our Board of Trade, expresses in their minute of the 28th October 1796, that the cultivation of Indig cannot be considered as decidedly established in Bengal until the Native shall chiefly manufacture it of a quality fit for the European market. <sup>1</sup> Upon a general view of the present appearance of the state of the indigo factories upon our account in the territories under the authorit of the Madras Government; for our apprehension that the market is Europe will be liable to be overstocked by the Bengal produce operate as more than a counterpoise to the abstract principle which wouldothe wise govern our decision, <i>vie.</i> , that it is our duty to promote new branche of trade in any of our settlements to which the soil and climate ma appear favourable."                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                    | In a correspondence between the Board of Directors and the Madra<br>Government, many interesting facts are brought out. For example, in<br>despatch dated May 1791, the Board approve of the Madras $e^{ex}P^{e_{TM}}$<br>ments with indigo seed from Bombay. "A new sort of indigo " is $re * e^{e_{T}} $<br>to and a report on its merit promised. The despatch continues—" The<br>box of <b>Nerium</b> indigo by the same conveyance has been inspected by a<br>eminent broker, and the samples valued at from 2\$ <i>. gd.</i> to <i>js. 3d.</i> a pound.<br>Reference is made to European indigo planters in Madras, but the spir<br>of the correspondence is a recommendation to discourage the expansion of<br>the industry, since the production was viewed as likely sooner or later t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Difficulties<br>between the<br>Planters and<br>Cultivators.<br>161 | far exceed the demand.<br>By 1837 difficulties had arisen in connection with the relation of the zemindars and planters to the actual cultivators. On this subject <sup>LOW</sup> Macaulay wrote a lucid memorandum of the greatest interest, which seem to have had the effect of preventing the Government from interfering except to organise a greater number of courts so as to obviate the incor venience necessitated by the distance from each other of those already i existence. Lord Macaulay wrote:—"That great evils exist, that g <sup>1</sup> ** injustice is frequently committed, that manyjrayats have been brough partly by the operation of the law and partly by acts committed in defiance of the law, into a state not very far removed from that of partial slavery-is, I fear, too certain." Again, "The regulation, which gave to the Indig planters who had made advances to a rayat a lien on the Indigo crop, seem to me highly objectionable in principle. But I do not conceive th^-frescinding it the Governor General in Council would give any sensible relief to that class of the population whose interests appear to be peculiarly the object of his solicitation. The question appears to be a question be tween the planter and the zemindar. It is not easy to see how it can be C any consequence to the rayat which of the two may distrain on his crop? I have no reason to believe that the zemindars exercise their p.«wer with more justice or how provide the planters." |
| engal Indigo'<br>Disturbances.<br>162                              | more justice or humanity than the planters."<br>Passing over a space of some thirty or forty years, which seem to have<br>been marked only by the continued withdrawal of all official support or en-<br>couragement, Indigo next attracts public attention in the troublous time<br>which culminated in the Bengal Indigo Disturbances of 1860-67. These<br>may be briefly summarised as the outcome of the system of land tenurs<br>which prevails in Bengal, in which a rent-receiver" or zemindar exiss<br>between the actual occupant of the land and the Government. In som<br>cases these zemindars temporarily or permanently sold their rights to the<br>owners of indigo factories, thus handing over to the planters a power of<br><b>I.</b> 162                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| dictating that a certain proportion of each holding should be annually<br>thrown under indigo. The green produce was contracted for at a fixed<br>rate, but while the value of all other crops had steadily improved, the rate<br>paid for the indigo plant practically remained stationary. Where even<br>the shadow of a legal right to enforce indigo cultivation did not exist the<br>system of making advances to the rayat secured compulsory cultivation.                                                                                            | HISTORY                           |
| Money offered at the season of the cultivator's greatest impecuniosity was<br>a bribe «that few could resist, and it was in the interest of the factory owners<br>to secure a maximum amount of indebtedness on the part of the neighbour-<br>ing rayats. By the law passed in 1830, but repealed in 1835, failure to<br>fulfil contracts could be criminally prosecuted. The effect of that enact-<br>ment was to give the stronger contracting party the protection of law, while<br>no consideration was shown to the weaker, who might have been forced | Advance-<br>System.<br><b>I63</b> |
| into contracts the full meaning of which he did not comprehend. But even<br>without special legislation the system pursued placed the cultivators largely<br>at the mercy of the planters if they chose to exercise their power. Com-<br>plaints of enforced cultivation of an unprofitable crop on the one hand,<br>and of the want of protection against dishonest cultivators on the other,<br>became rife. Expensive supervision and protracted litigation told heavily<br>against the industry and led to unlawful restraint and assault which in      |                                   |
| certain parts of Bengal culminated in a disturbance that necessitated mili-<br>tary protection. A Commission was appointed by Act XI. of i860 to en-<br>quire into the whole subject, and the Report of the Commission revealed<br>the existence of faults on both sides. The Act gave powers to the Magis-<br>trate to enforce the completion of contracts to grow indigo where advances<br>had been made; but where such contracts were found to have been<br>obtained by fraud, force, or unlawful intimidation, the complaint was to be                 | Legislation.<br>164               |
| dismissed. By Act VIII. of 1868, this special "Indigo Contracts Act" was, however, repealed. His Honour the Lieutenant-Governor of Bengal, in reviewing the Report furnished by the Commissioners, said :—"Setting aside individual cases having no connection, or at least no necessary connection, with the indigo system, that system is fairly chargeable with a very notable portion of those classes of offences the peculiar prevalence of which in Bengal has been from the first a blot in our administration. In                                  | •                                 |
| my opinion it is rather the system than the planters individually who are<br>to be blamed. It is to the unprofitableness of the cultivation of indigo at<br>the extremely inadequate price given for it, under the system, necessitating                                                                                                                                                                                                                                                                                                                    |                                   |

spontaneously reform itself from within is not surprising. The chief fault was in the defective, and I fear I must say the not impartial, administration of the law, which allowed such a vicious state of things to exist." Difficulties also arose in Behar in 1876-77, and an elaborate enquiry Difficulties was then instituted by the Bengal Government into all the complaints. But the charitable action of the planters to their cultivators during the famine and the kindly way they were then spoken of by the poor in their neighbourhood, satisfied the Government that no cause for interference existed save to put down with a strong hand any violations of the law on either side that might come to notice. The enactments that are still in force regarding indigo cultivation will be found in the Bengal Code, v»,, Regulation VI. of 1823, and an amendment to it passed in 1830, as also in the Local Act X. of 1836. These provide that if a rayat by contract takes advances to cultivate a certain prescribed portion of land with indigo, he

either a forced cultivation, or the abandonment of the manufacture from Bengal rayaty plant, that this and every other evil connected with indigo is attributable. An individual manufacturer could not live upon a fair and free system, surrounded on all sides by competitors who get their raw produce without paying nearly its full value. That a whole class did not

**INDIGOFERA** 

Behar.

**16S** 

| NDIG0FERA<br>tinctoria.                        | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| HISTORY.                                       | can be prosecuted should he fail in his contract, and the person who make<br>an advance on such a contract is thus recognised as having a lien or inter-<br>est in the indigo-plant, and is entitled to avail himself of the protectio<br>of the court should his interests be threatened. These regulations pro-<br>vide also for the criminal prosecution of persons inducing rayats to break<br>their contracts, and the punishment of persons who damage the mdigo<br>plant. On the other hand they provide for the protection of the raya<br>against any enforced cultivation, and give him full power $tf$ ) refuse 1<br>renew a contract which has just expired. The occupancy rights $^{\circ} * JJXi$<br>in possession offland for twelve or more years is fully recognised, li the<br>have completed their contracts or are prepared to pay the damages $^{aw}$ a $^{aH}T$<br>by the court for non-fulfilment of contracts, they cannot be compelled<br>grow indigo; still less can they be deprived of their holdingsjor no<br>doing so.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Indigo<br>Planters'<br>Association.            | At several periods the planters have formed associations which no<br>since practically been consolidated into the Indigo Planters' Association<br>Important reforms have been effected through the planters mutually a get                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 166                                            | ing to observe certain rules, and the indigo industry has thereby bee<br>placed on a more rational basis. But a migration of a pronounced Kan<br>took place from Bengal, where the action of the Government was four<br>opposed to certain individual interests, and it may now be said that ^ni<br>the best quality of dye is still produced in Bengal, the chief seats of the<br>industry are in Behar, the North-Western Provinces, and Ma. dra<br>The action of Government in removing the import and export duties,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Removal of<br>Duty.<br>167                     | also the tax on the green plant, greatly favoured the development of Indian indigo trade. Previous to the 5th August 1875 there was an <sup>e</sup> *P <sup>51</sup> duty of R3 a maund; but from that date it became R3 <sup>a maun</sup> ?u 8 manufactured indigo, and R3 a ton on indigo leaves, while on the 25 <sup>th</sup> February 1880 the duty was entirely removed. Imported indigo <b>*</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                | subject to a duty of 7J per cent., but from the 5th August 1875 it becam<br>5 per cent., and was altogether removed on the 10th March 1882.<br>Enough has perhaps been said to convey a general idea of the $10^{16}$ s. $10^{10}$ facts connected with the growth of the indigo industry. The $10^{10}$ figures of trade, in another paragraph, will complete the sketch. It $10^{11}$ figures of trade, in another paragraph, will complete the sketch. It $10^{11}$ seen shown that the earliest European accounts of indigo manufactur<br>are associated with Southern and Western India. That the trade the<br>migrated to the West Indies and America, was restored to India through<br>the enlightened, though monopolising policy of the East India Company<br>but was then established in Bengal. That half a century later it had. t<br>leave some of its most productive areas, through a selfish policy of culfiv<br>vation, and lastly that a new feature arose in the keen competition of the<br>native growers of Madras. An examination of the trade statistics will<br>show how vastly more important Madras Indigo has become within recen-<br>years, thus justifying the far-sighted policy of the East India Company<br>in urging the importance of getting the growers to be themselves manu-<br>facturers of the dye. If one idea more than another came out pointedly a<br>the result of the enquiry of i860, it was that the Bengal planters were ad<br>mittedly paying a very low price to the cultivators for a crop, of which, one o<br>the seasons of cultivation proved irksome to them, since it prevented their de |
| Objections<br>to Indigo<br>cultivation.<br>I6S | the seasons of cultivation proved irksome to them, since it prevented their de<br>voting themselves to their chief food crops. Elpt the cultivators of Madra<br>and of many parts of Upper India are not only not opposed to growin<br>indigo but do so willingly, since in these regions it not only does not conflic<br>with, but improves the food crop with which it is grown as a valued roja<br>tion. In the reports of occupancy manufacture, highly remunerative<br>returns are given. It would appear to richly pay the grower and manu-<br>facturer of small holdings, while it may not be remunerative to a privat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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| The Indigo Plant of Commerce $(C Watt)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <u>ctoria.</u>                                                                                  |
| European factory to prepare the dye alone. But the danger anticipated<br>and carefully guarded against by the East India Company, <i>viz.</i> , the<br>undue production of inferior native indigo, is in full operation to-day;<br>and were the number of the European factories from any cause to be<br>seriously diminished, it seems just possible that India might once more<br>witness a partial migration of the industry to European colonies. The<br>one saving feature seems to be a wholesale reduction of expenditure in<br>manufatture similar to what has taken place in Tea—thus narrowing the<br>profits but paying on large concerns. The decline in the price paid in<br>England for indigo since 1880—a decline of fully 35 per cent.—maybe<br>viewed as, in part, the result of the competition within India itself, a country<br>which enjoys a practical monopoly in the production of the dye; though<br>doubtless, the competition of inferior dye-stuffs, and fluctuations in cur-<br>renc <sup>•</sup> , have also exercised a depressing influence. The competition of<br>Madras, for example, with other parts of India, must have been serious;<br>for within the 25 years ending 1881-82 the cultivation has expanded in South<br>India over 133*8 per cent, and the exports over 116 per cent., while those of<br>Bengal have decreased 3*2 per cent. The exports from Madras in 1855-56<br>were 2,852,713ft, while last year (1887-88) they were 4,794,944ft or an in-<br>crease in 32 years of 68 per cent. From Bengal in the same years they<br>were 10,106,768ft and 9,781,520ft. The exports from Bengal, however,<br>convey a much less accurate idea of the actual Bengal trade than do those<br>of Madras of the Madras trade The Bengal exports include the pro-<br>duction in the North-Western Provinces, and Oudh. Indigo cultivation<br>has seriously declined in the Lower Provinces. In fact the chief modern<br>feature of the so-called Bengal indigo trade is the rapid expansion of<br>cultivation in tracts under canal irrigation and the great increase of<br>factories owned and worked by natives. Tirhút may be described as the<br>most productive indigo area, as it is a | Growth<br>of Madras<br>Trade.<br>169<br>Expansion<br>in Canal-<br>Irrigated<br>Tracts.<br>170 . |
| CULTIVATION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CULTIVA-<br>TION.                                                                               |
| Soils, Methods, Yield, Cost/and Prqfit.—The system of cultivation<br>pursued in the various provinces of India is so nearly alike, that it need<br>be necessary only to describe in detail one or two provinces- the<br>notices of the others being more or less restricted to the indication<br>of departures from the general types. Thus, for example, there are<br>three distinct methods pursued in Bengal, characteristic of three import-<br>ant sections of the Presidency, <i>i.e.</i> , Lower Bengal, Northern Behar,<br>and Southern Behar. In Lower Bengal a two-fold system arises from<br>the fact that large portions of the Indigo lands are within the area of<br>Gangetic inundation, while in different districts or portions of the same<br>district, higher lands that become annually submerged by the rainfall are<br>also thrown under indigo. In both of these conditions irrigation is conse-<br>quently quite unnecessary, and, the soil being recent alluvial deposit, a<br>simple system of cultivation with broad-cast sowings is all that is required.<br>In South Behar ( <i>i.e.</i> , Patna, Gay a, and parts of Chutia Nagpur) irrigation<br>from tanks and wells, and in Shahabad from canals, is found necessary, so<br>that the system of indigo cultivation, there pursued, resembles very much<br>that of the North-Western Provinces and the Panjáb. In Northern Behar<br>(Tirhút, Champarun, Sarun, &c), a very high class cultivation with dril<br>sowings is practised, and although well and tank irrigation is available<br>such aid, owing to the fertility of the soil, is very frequently quit<br>unnecessary. To a small extent similar high class cultivation is accom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 171                                                                                             |

I. 171

| INDIGOFER<br><u>tinctoria.</u>                | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| CULTIVA-<br>TION.                             | plishedin parts of Lower Bengal on high lands but mostly as spring sovings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Objection to<br>Indigo<br>eultIvatio n<br>172 | While, therefore, Northern Behar may justly be described as the head-quarters of the indigo industry, some of the districts of Low Bengal, such as Jessore and Nadiya, still continue to produce the monighly prized qualities. The advance of the industry from Lower $B^{en}$ to the Upper Provinces may, in a measure, be due to the loss of a $P^{oW}$ , to enforce cultivation, but the rapidity with which it has spread into the new or greatly enriched tracts, under canal influence, would seem to point to another explanation—direct gain. It is possible also that exhaustion the soil to indigo, though improvement to rice, may have in some case necessitated irrigation, which was not in every district easily obtamable. At all events through the aid of canals, large tracts can now be cultivatered during a period when the land was formerly left in fallow, and it see 7 highly probable that, instead of being exhausted to rice and wheat, the soil is greatly improved by the extra crop. The rayats of Upper Inai would thus seem to recognise in indigo an additional source of profit with out any serious injury to their other crops. In Lower Bengal* on the other hand, the spring-sown crop has to be attended to at the very time of * principal rice sowings. It is thus not a favourite crop, since it is legremunerative than rice; but to the planter it yields a very superior quain of dye. |
| BENGAL.                                       | IBENGAL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 173                                           | 1ST—NORTH BEHAR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Digging.<br>174                               | Preparing the Land.—Mr. W. M. Reid (in his Culture nnd Mannf <sup>**</sup><br>ture of Indigo) urges the necessity of deep and thorough DIGGING $^{u}T$ ?<br>for high non-inundated lands such as those of Behar. This should<br>commenced as soon as last year's manufacturing is completed. " ^n the<br>work of digging deep down will depend," he says, "in a great meas, the<br>the future health and growth of the indigo plant, and it cannot be, w<br>carefully supervised." The digging ended, the PLOUGHING next begin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 175                                           | The ploughs used are the ordinary native wooden plough with an iro<br>ploughshare. Usually five or six ploughs work alongside of each othe<br>passing, say, north to south along the field, while a second set work $a^{ac*05}$<br>the furrows from east to west. In this way the surface soil is complete<br>broken up over the deeper digging which was effected by the hand o<br>using the ordinary large hoe or <i>kodal</i> . When the ploughing has been                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Rolling.<br><i>rjt</i>                        | completed, the field is next ROLLED by wooden rollers, of smooth cylinders<br>or constructed with a rough thread like a screw. By this means in<br>clods are broken up, and the field levelled. For the purpose of rolling<br>the oldest and most worn-out bullocks are employed which, as Mr. Rei-<br>explains, •« not being smart and active enough for ploughing are put to<br>this slow and arduous work in which dead weight tells more than strength<br>and activity. After rolling down the clods, the ground is again plougher<br>up, perhaps three or four times, according to the dryness, stubbornness<br>or clayiness of the soil. The smaller clods which remain are then finally<br>broken by hand by gangs of, from 50 to 100 women and children, boy<br>and girls, in one long row, who keep up a perpetual din, beating time of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Sowing.<br>177<br>Seed-drill.<br>178          | the clods with thick short sticks amidst clouds of dust until there is not<br>a lump left bigger than an ordinary walnut."<br>Sowing.—The land having been thus thoroughly prepared, sowin<br>commences about February. For this purpose a SEED-DRILL is used—a<br>adaptation from a native implement - specially constructed for indig<br>purposes. This has been briefly described (in <i>Gleanings of Science, Mo</i><br><i>i*29h</i> tnus:— The shares cut the furrow, the wheels of the machin<br><b>I. 178</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | DIGOFERA<br>inctoria.                        |
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| turn those of the trough, the slanting holes bored in the wheels of the trough, during their passage through the seed, take up each one or more seeds (seldom more than one), and, in the downward part of their revolution, unload themselves with precision into the hoppers, which lead them into the hollow of the ploughshares, which last deposit the seed in the furrow and enclose the seed in an instant." Mr. Reid gives a more detailed description of the drill, urging that the wheels and trough must be constructed of <i>Shisham</i> wood (Dalbergia Sissoo), the latter lined with galvanized iron. Tc ascertain the rate of discharge of seed, the number of revolutions of the seed-wheels in a given distance is tested and the quantity of seed discharged carefully collected in small bags. If too much or too little seed be distributed, the holes are enlarged or diminished until the desired rate of sowing is obtained. The eight-shared drill is that generally employed, but a four-shared to a twenty-shared drill may be used. "After the drill follows an instrument, drawn by bullocks, like a long bamboo ladder, which smooths the earth over the seeds, and then the lands are left. In from four to five days the seeds germinate, generally on or about the third day, and the two first leaves of the plant peep forth." | CULTIVA-<br>TION.<br>BENGAL.                 |
| Manuring.—As the lands become exhausted by constant indigo cultivation, where renovation is not accomplished by annual inundations from the rivers, it becomes essentially necessary to manure. For this purpose the cheapest and best material is the <i>seet</i> or refuse plant after the indigo has been extracted. This is dried and carefully stacked, as it is not only of value as a manure for the higher lands not inundated, but it is the fuel used in the succeeding- season for the boilers. In Lower Bengal <i>seet</i> manuring is not practised, or only rarely so, since the rivers overflow the indigo fields and richly manure them with fertile deposits. In Tirhút, on the contrary, and the upper parts of the province, <i>seet</i> manuring is regularly followed. For this purpose, it is carted to the fields and deposited in heaps in regular lines all over the field, and is then trenched into the soil.                                                                                                                                                                                                                                                                                                                                                                                                                          | Manuring.<br>179                             |
| <i>Weeding.—By</i> the time the plant is a few inches above ground, weeds<br>will have grown to such an extent as to necessitate weeding. This is done<br>by a small cutting instrument held in the hand and plunged two inches<br>under ground, so as to cut the weeds off without injuring the indigo. The<br>weeds should then be carried to the margin of the field and not piled in<br>heaps on the field, by which latter careless process many young indigo<br>plants would be killed. Weeding may have to be repeated until the<br>indigo crop rises above the height of being injured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Weeding.<br>ISO                              |
| <i>Cutting.</i> —Indigo is ripe when the flowers begin to appear. This generally takes place about June—earlier or later according to the nature of the season.<br><i>Irrigation.</i> —In exceptionally dry seasons irrigation may be necessary, and in Bengal this is generally accomplished by a slung basket worked by two men; holding the ropes attached to the basket they throw the water to the higher level. At other times a bucket suspended from a beam, with a mud weight at the further end, is employed. Occasionally a eathern bag drawn from a well by bullocks running down an inclined plane is used. On the bag coming to the top of the well it is swung over the end of the drain and the bullocks made to step backwards. The bag thus coming to rest collapses and the water runs off. China pumps, Persian wheels, or various steam pumps may also be used, but in Bengal, when irrigation is practised (which is but rarely), the two first-mentioned methods are generally pursued to raise water from a tank or blind canal flowing from a river; except in Behar well irrigation is rare.                                                                                                                                                                                                                                            | Cutting.<br><b>I81</b><br>Irrigation*<br>182 |

| INDIGOFEI                                                           | The mulgo Thant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| tinctoria                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CULTIVATION.<br>BENGAL.<br>Carting.<br>183<br>Steeping-vat.<br>184. | Carting to the factory,—All arrangements for manufacturing <sup>ha</sup> Y''?]<br>been completed the planter fixes a day for commencing cutting. * n<br>lower-lying portions of his estate or plantation are selected for first cu-<br>tings. This is necessitated through the fact that the rivers at this & <sup>a*</sup> *i<br>(June) are liable to rise rapidly and overflow their banks, when many acre-<br>of ripe crop may be destroyed in a few hours. This remark is, <sup>how</sup> 1 <sup>rg</sup><br>more directly applicable to the Lower Provinces than to Behar, <sup>w</sup><br>inundation only occasionally occurs. The crop is cut with' a sickle a<br>tied into bundles. When cultivated by the rayats and sold to the own<br>of a factory, it is paid for by the bundle. The size of the bundle vanes<br>so greatly, however, in the different parts of the country, that much C <sup>A</sup><br>fusion in estimating the outturn is due to this cause. Most <sup>fact0</sup> H <sup>es</sup> cut<br>a chain for measuring their bundles. As soon as possible after being<br>and bundled, it is conveyed to the factory, either in boats on the nyef. the<br>up the short canal leading to the factory, or by carts. On arrival at<br>factory it is packed in the STEEPING-VAT when the cultivators interest<br>the crop ceases, and the operations of the manufacturer commence.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| south<br>behar.<br>185                                              | 2ND—SOUTH BEHAR—PATNA, GAYA, AND SHXHABAD.<br>Mr. Reid remarks that the system of cultivation adopted by ***£?*<br>pean factories in the districts of Behar south of the Ganges, is gf £                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Sowing,<br>186                                                      | allied to that pursued almost universally by the native concerns of <i>r</i> monsture,<br>res and the North-West Provinces. The soil is non-retentive of monsture,<br>and consequently the sowings in Shahabad and contiguous stricts are<br>chiefly carried on during the rainy season in July, August, and <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasons of sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasoni</i> . <i>Sowing</i> .—The early rainv season sowings <i>screenber</i> .<br><i>Seasoni</i> are reaped in July and August, when the crop is known as the <i>A source</i> .<br><i>Seasoni</i> crop is a precarious one, and it is only in <i>screenber</i> . <i>Assarhi</i> crop. Mr. Reid proposes the name <i>Nunda</i> for the late sow <i>screenber</i> .<br><i>Assarhi</i> crop. Mr. Reid proposes the name <i>Nunda</i> for the late sow <i>screenber</i> .<br><i>Assarhi</i> crop is weeded in December, January, and February, and is <i>screenber</i> .<br>May. It may be designated the backbone of the Shahabad indigo crup.<br><i>Nay</i> . It may be designated the backbone of the Shahabad indigo crup.<br><i>Source</i> sown in March and April under the <i>assami-war</i> system— <sup>tran</sup> .<br><i>Screenber</i> .<br><i>Source</i> will sow so much indigo on opium lands after the opium season.<br><i>The transform</i> from the factory on the understanding <i>transform screenber</i> . |
| Manufacture.<br>187                                                 | bag through the traction of bullocks made to run down an inclined path-<br>bag through the traction of bullocks made to run down an inclined path-<br>The opening of the Sone Canal added a fourth and very importan in the<br>to Shahabad, which is known as the <i>Falguni</i> , from the fact of its ocids<br>sown in the month of February-March. Lands owned by the taw <sup>6</sup> j<br>( <i>Niz</i> cultivation) are generally used.<br><i>Manufacture.</i> —The operations of the factories in Shahdbio us<br>commence in July, and the <i>Nanda</i> and <i>Jamana</i> crops yield the best<br>returns. The second term of factory work generally commences in Octo-<br>ber, during which time the <i>Assarhi</i> and second cutting of the <i>IKhunti</i><br>crops are reaped.<br>The system of cultivation in Patna, Gaya, and Shahabad is very near-<br>ly similar to that which will be described under the paragraph on the<br><b>I.</b> 187                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | inctoria.              |
| North-West Provinces, and, indeed, the indigo manufactured in this dis-<br>trict is in the trade classed with that from the North-West Provinces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | CULTIVA«<br>TIOK.      |
| 3RD—LOWER BENGAL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | LOWER                  |
| The method of cultivation pursued in the Lower Provinces is less elabo-<br>rate than in Northern Behar—the nature of the soil and the conditions of<br>climate alike operating against the necessity for high cultivation. The<br>bulk of the indigo fields are annually inundated, and thus covered with a<br>rich alluvial deposit which, even when dry, does not require a rigorous<br>method of ploughing and clod-breaking.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | BÊNGÂL.<br><b>18</b> 3 |
| Sowings*—There are two October sowings, and a less extensive though<br>highly valued crop in April. As the water subsides in September-<br>October from the muddy banks and <i>chars</i> (islands and shallow promon-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Sowings.<br>189        |
| tories in the river bed), the seed is sown BROADCAST. PLOUGHING would                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dloughing              |
| tories in the river bed), the seed is sown BROADCAST. PLOUGHING would<br>be impossible, but by means of a bamboo or raft of plantain stems, the<br>cultivator is enabled to move about over the soft slimy surface and thus<br>^ scatter the seeds. His supply of seed is carried in a water-tight basket<br>made by winding rattan canes round and round continuously, each coil<br>being fastened hard on the others by ascending ties of split cane. On<br>being plastered with cow-dung these baskets are rendered water-tight,<br>and they are very durable. Floating on the surface of the water or slimy<br>mud the seed supply is thus pushed over the field, and the seed scattered<br>by the hand as uniformly as possible. By its own weight it soon sinks to<br>a depth of two inches, and within a few days, begins to germinate. By<br>this time in some districts the higher <i>char-\ands</i> have dried sufficiently to<br>allow of the ladder-like harrow being drawn over, thus smoothing the sur-<br>face and consolidating the soil around the seeds, but such harrowing is in<br>most cases quite unnecessary.<br>This method of cultivation is in Lower Bengal known as <i>Chit' ant</i><br>(meaning to scatter); and so far it is very cheap, but as the plants spring<br>up there appears with them a rampant growth of weeds, which proves<br>a source of very considerable annoyance, and involves a very heavy weed-<br>ing expenditure. Sometimes cattle are turned on in December and Jan-<br>uary to browse down the rank vegetation, and in the early state of the<br>October sowings little harm is thereby caused to the crop, while a much<br>valued concession is granted to the rayats. But as the banks of the rivers<br>of Bengal are often densely covered with the scrubby plant, Tamarisk(^aw),<br>when this extends over the <i>char-fields</i> (as it only too frequently does), the |                        |
| greatest possible annoyance is occasioned. The roots penetrate, if anything,<br>deeper than the indigo, and if not uprooted early, the crop may often be<br>thus seriously injured if not entirely destroyed. By the time the hot weather<br>in April and May has come round, the <i>char</i> lands have become very dry<br>and hard. They have split up into great squares or brick-like sections—<br>the cracks often gaping two or three inches and penetrating to the tips of<br>the roots of the crop. Further growth is arrested, and the plants wither                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| up to a crop of thin twigs, with a few sickly leaves. They are, however,<br>by no means killed, and when the rains in June begin to soften the soil,<br>the invigorating moisture of the first showers is carried by the cracks<br>straight to the roots, with the result that the sickly-looking twigs at once<br>burst into a fresh vigour and produce an abundant crop of highly valuable<br>dye-yielding leaves.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| On more elevated lands the second class of October sowings are made.<br>For this purpose the land is ploughed once or twice and the clods broken                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |

For this purpose the land is ploughed once or twice and the clods broken by drawing the ladder-like harrow (the *mute*) over the surface. The soil of Bengal being of a more recent alluvial nature than that of Tiihut and Behar generally, a much less elaborate system of cultivation is neces-

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| INDIGOFERA<br>tinctoria.              | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| CULTIVA-<br>TION.<br>LOWER<br>BENGAL. | sitated. The soil is easily pulverised, but as with the <i>char</i> lands, the sector is sown BROADCAST and not drilled in, which is the method in $ii \gg_{i}$ it. In these higher <i>dengali</i> lands the sowings have to be made expeated of each of the source for if the soil be allowed completely to harden on the experts of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Mixed Crops.<br>191                   | ously, for if the soil be allowed completely to harden on the evaporar 101 of<br>the surface moisture, it becomes impossible to plough and harrow attle<br>ciently for indigo sowings until it again becomes softened by rain, and<br>are also sometimes allowed to browse over the <i>dengalt</i> indigo neias,<br>in April and May they are carefully weeded October<br><i>Mixed Crops with Indigo, and Rotation.</i> —Along with the ^''eeds,<br>sowings of Indigo the roy: frequently sows winter crops, such as << son,<br>and thus ekes out an additional return of R2 a bigha. Mr. P. ^, TMS<br>in his interesting report on indigo cultivation in Rajmenal, menualixed<br>sowings,—October and April, and alludes to the advantages of pi ^                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Rotation.<br>192                      | twofold : (a) the plants are established in the fields against the'-'''''_j-o<br>the vigorous growth with the fall of rain; (b) the chief labour ot, mak<br>cultivation is accomplished at a season when the rayat has very ii'_ATjON<br>to occupy his time. The rice crop has been harvested, and the ROT de-r<br>of indigo is highly advantageous. The roots penetrate to a $S_{-X} _{x_0}t_0$<br>than the rice, and thus while directly improving the soil on the pun <ch <math="" a="" always="" and="" break="" crop="" dot="" leguminous="" may="" rotation,="" soil,="" tends="" the="" to="" up="">J_X J_j^{-e}</ch>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Reaping.<br>193                       | greater depth into bearing, but above all an extra crop of winter pr<br>is obtained by the same operation.<br><i>The reaping takes</i> place in June, July, and August, or it argent full<br>crop, even as late as September. These autumn sowings thus occu^j<br>soil for a period of eight months.<br>The April or spring sowings take place at the very time the <b>regats may</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Profit.<br>194                        | be said to have their busiest season. They are then anxious the said their lands for the <i>ausdhan</i> (or spring rice), a crop on which it may hanter they largely subsist. The interests of the cultivator and the inaig <sup>011, Au</sup> and at that period, therefore, seriously conflict, for to <i>both</i> delayed s is that period, therefore, seriously conflict, for to <i>both</i> delayed s is the cultivator and the inaig <sup>011, Au</sup> and a compulsory April cultivation may be said <i>I</i> are profitable of all, and a compulsory April cultivation may be said <i>I</i> are occasioned many of the serious misunderstandings that arose between the rayats and the planters. The cultivators, while willing, as a rule, to H ere take sowings in October, seriously object to extensive April crops An overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than with rice, the labo <sup>17</sup> control overlooked. While the return is far less than after the <b>BOAD</b> cost of the solution of the second after the <b>BOAD</b> cost of the solution overlooked. While the return overlooked is the cost of the cultivation of the second after the <b>BOAD</b> cost of the solution overlooked is the cost of the cultivation overlooked is a linter the <b>BOAD</b> cost of the cost overlooked is the co |

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| The letter Plant of Commune (C. Watt) INE                                                                                                                                                                                                    | <b>DIGOFERA</b>         |
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| The Indigo Plant of Commerce. (G. Watt)ti                                                                                                                                                                                                    | nctoria                 |
| by the other 678) an acre. The bundle of green plant is an ever changing                                                                                                                                                                     | CULTIVA-<br>TION.       |
| quantity, but of Jessore it is said, the yield of dye is 3 to 4, or even 7 maunds<br>per 1,000 bundles. Again, in Mr. Sheriffs report it is stated, "The yield<br>of dye is about 6 cwts. per 1,000 bundles (a bundle weighing about 300ft). | LOWER<br>BENGAL.        |
| This would therefore be 1 in 461, and it is probable from this that 5,53 <sup>2</sup> & <sup>o</sup> f plant were produced per acre. In Mr. <b>Manson's</b> interesting report on                                                            |                         |
| Indigo cultivation in Rajmehal the yield of plant is put down at 30 to 40 bundles per acre and the yield of dye at very nearly 12ft an acre. Dr.                                                                                             |                         |
| McCann, in his <i>Dyes and Tans</i> , fortunately devoted much careful study to the Records in the Economic Museum relating to the yield of dye per acre,                                                                                    |                         |
| riis conclusions have been verified by the writer, with the result that it appears safe to take the yield in the Lower Provinces at 10 to 12& an acre,                                                                                       |                         |
| and in Behar at nearly 20ft an acre.<br>The cost of cultivation has been so variously stated that it is perhaps                                                                                                                              | Cost Of<br>Cultivation. |
| scarcely necessary to review all the figures. The differences proceed main-<br>ly from the view taken as to the advantages or otherwise of indigo culti-                                                                                     | Profit.<br><b>195</b>   |
| • vation. Certain items have been debited or credited in one return and omitted from another; and the system of making advances has been alaimed as a been or pronounced assures according to the projudices of the                          |                         |
| claimed as a boon or pronounced a curse according to the prejudices of the writer. But the system of making advances, however objectionable it might be made in individual cases, is a necessary outcome of all produc-                      |                         |
| tion not intended for homestead consumption, and is carried out by Gov-<br>ernment successfully in the opium industry. Unless a market exists the                                                                                            |                         |
| plant is of no value" in itself to the cultivator, and unless plant be available<br>the capitalist could not be expected to erect a factory. The planter is re-                                                                              | u .                     |
| quired therefore either to own or to lease the land, or is compelled to hold<br>out such inducements to occupancy tenants as may secure a regular cul-<br>tivation sufficient to support his factory. The fault lies, not so much in         |                         |
| the system of advances, as in the monopoly thereby secured to each cor-<br>cern by which the price paid for the field produce is kept stationary, in-                                                                                        |                         |
| stead of being allowed to progress with the increasing value of all other<br>produce. That the price paid until recently was too low there seems no                                                                                          |                         |
| doubt; and the thousands of ruined factories now met with in many parts<br>of the country bear testimony to the natural punishment that befell                                                                                               |                         |
| those who either could not, or would not, correct and reform their system<br>of treatment of the rayats. The loss to the cultivator, as matters stand,<br>is hypothesical. It is a loss of the difference in value of the indian             |                         |
| is hypothetical. It is a loss of the difference in value of the indigo<br>as compared with another crop. The assumption is involved that the land<br>could or would have been required to grow that other crop. It might                     |                         |
| fairly be contended that the increased value of agricultural produce is the outcome of the multiplicity of crops brought about by foreign demands.                                                                                           | 1                       |
| The land is required for oilseeds, fibres, dyes, food-stuffs, &c. The surplus not absolutely necessary for food crops would naturally be thrown under                                                                                        | of Indigo               |
| the most profitable market crop. In many parts of Bengal, where indigo was formerly grown, jute has proved more profitable; but jute and indigo <sub>L</sub> are only two of the crops by which the foreign markets have                     | cultivation.            |
| enhanced the value of the Indian soil and extended the area of cultivation<br>beyond the good requirements of the people. The subsequent compensating                                                                                        |                         |
| influences of indigo cultivation, which cannot be shown on a balance sheet,<br>have to be borne in mind, and are fully appreciated by the more intelli-                                                                                      |                         |
| gent rayats. The cash advance is a distinct gain, coming as it does at<br>the time of the cultivator's greatest impecuniosity. Prosperity is not                                                                                             |                         |
| accompanied by increased rent, as is only too frequently the case with the<br>ordinary zemindar. The crop is easily grown and requires little or no<br>attention, thus enabling the rayat with his limited resources to cultivate a          |                         |
| greater area. Mixed crops are frequently raised on the same fields, and                                                                                                                                                                      | 1                       |
| I 196                                                                                                                                                                                                                                        |                         |

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| INDIGOFER.<br>tinctoria               | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| LOWER<br>BENGAL.                      | for these (which afford many requisites of life) the same labour and <b>expense</b><br>would have to be incurred as are necessary for a joint indigo crop.<br>rotation of a leguminous stock such as indigo is essentially necessary.<br>roots penetrate to a great depth and draw their moisture from, so<br>which the cereals never touch. They tend thus to bring a greater depth<br>into bearing. The manure given to the indigo (and debited to the indigo conduction of a fallow, greatly enrich the soil. It is in fact; ""Ver A" J<br>admitted that a better crop of wheat or rice is obtained after indigo that<br>could possibly have been the case after a millet or other minor food cr. H<br>While the indigo crop is young, the fields are freely permitted to be use<br>as grazing grounds by the cultivators, and as the cattle eat the weeds<br>will not touch the indigo, the advantages of this concession are £J <sup>utual</sup> to<br>the rayat and his European neighbour. The presence of a Jj ^ P *a<br>capitalist in a rural district must also have its advantages. He will at ie<br>be a less exacting creditor than the village money-lender, for it is m<br>interest to keep his cultivators and their cattle in good healthy condi-<br>tion. His factory affords employment to a large community who are <i>too</i><br>purchasers, and even the <i>rayat</i> directly participates in some of the collater<br>advantages, for he owns cattle and carts and sometimes even b°ats, and<br>gets paid to convey the produce of his tithe of indigo plant to the "ac" "J |
| Cost of<br>Cultivation.<br><b>197</b> | Mr. Collin reports that in Bengal as a whole, the planter P ^ / fj ^<br>R12 to R15 a bigha for indigo land, including rent of R3 "!J ''L<br>int R4 to R5 is the actual cost of cultivation, and something is P '' a<br>amount R4 to R5 is the actual cost of cultivation, and something is p <sup>riv</sup> ."<br>ly paid to the factory servants, leaving a profit to the <i>rayat ot</i> 1<br>R4 to R7. The net profit on a good crop of rice on the same field *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NW. P. 4<br>OUDH.<br><b>198</b>       | be about R8 to Rio, but such a crop could not be continuously ©warn<br>and if all land were under rice the profits would seriously decline.<br>11NORTH-WESTERN PROVINCES AND OUDH.<br>In the commercial returns of indigo, the produce of these provinces,<br>referred to two sections—Benares and the Doab. The former incluage<br>Goruckpore, Ghazipore, Azimgarh, Benares, Jaunpore, and Allahabaa,»-<br>the small tracts of Oudh and Rohilkhand that have indigo; the latter, and<br>places above Allahabad in the inter-fluvial tract between the Ganges and<br>the Jumna, extending to Meerut and Saharanpur, and south of the Jumn<br>to Jhansi. This distinction is made on account of the difference in the<br>quality of the indigo produced in the two regions, and it may be her<br>pointed out that the former is well and tank, and the latter canal, irrigated<br>T his amerence is of considerable importance, for, while the weits filt in the<br>obtained by canal irrigation is heightened, the yield and quality or the<br>is lessened and deteriorated. The valuable communication on J'A & Voo<br>these provinces received from Colonel Pitcher, Director of Land K<br>and Agriculture, contains the following brief massages meanding the                                                                                                                                                                                                                                                                                                                                   |
| Ploughfngs.<br>I<br>Manure.<br>200    | vation of the plant: - <sup>M</sup> The number of PLOUGHINGS in the Doab<br>exceeds two, but in the Benares Division, indigo fields often receive a sam<br>as four ploughings. MANURE is very seldom used, but when possible ina s<br>follows sugar-cane or cotton, and it thus derives some benefit from<br>manures applied to these crops. Experiments in the Government far                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Waterings.<br>201                     | at Cawnpore show that gypsum is a valuable manure for indigo as for $\circ$ the leguminous crops. For indigo sown in spring ( <i>Jamana</i> ) the <i>nurawr</i> waterings vary from one to three according to the dry ness of in weather. Indigo sown at the commencement of the rains ( <i>Asari</i> receives no watering. As already remarked under "Rotation," "Indig often follows sugarcane or cotton, and unless kept for seed it is general followed by wheat or barley the same year." Speaking of the rotation <b>I.</b> 201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| The Indigo Plant of Commerce. (G. Watt)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DIGOFERA                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| ti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | nctoria.                                |
| Indigo, Messrs. Duthie and Fuller ( <i>Field and Garden Crops, page 45</i> ) remark :—" The outturn of a <i>rabi</i> crop (wheat or barley) will not be above half what it would have been if grown after a fallow in the rains, but it is only with indigo that this much can be obtained unless the land be manured, the outturn of a <i>rabi</i> crop grown on unmanured land after millet or maize being extremely small." It is most commonly grown alone, as the period of its growth does not coincide with that of any other crop. Occasionally, however, it is mixed with <i>jnur</i> or <i>arhar</i> , and is surrounded with a border of castor plant, or of <i>son</i> (hemp) more with the idea of one crop insuring the other than with any hope of reaping the produce of both. A loam is preferred, but much of the cultivation is on the lightest possible sand in tracts where copious irrigation is possible from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CULTIVA-<br>TION.<br>NW. P. ft<br>OUDH. |
| canal."j " It is essential that the crop be kept free from weeds, and two                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Weeding.                                |
| WEEDINGS are the least that are given.<br>Extended Cultivation in Canahirt{gated Tracts; its Effects*—The<br>Director of Land Records and Agriculture in these Provinces observes:—<br><sup>W</sup> A good deal has been written during the past few years about the per-<br>nicious effects of the method of indigo cultivation pursued in canal-irrigated<br>districts. There is no doubt that the abundance and cheapness of canal<br>water has enabled the cultivator to #row indigo as an extra crop on lands<br>which, before the advent of the canal, ordinarily lay fallow after the Kharif<br>or Rabi harvest until the setting in of the next rains. In the old days,<br>when the sut;ar-cane or cotton crop had been harvested in January or<br>February, the soil had rest for several months. Now an indigo crop is<br>promptly put down, and on being cut in August is followed by sowings of<br>cereals in October or November. The amount of manure received by the<br>land is certainly no greater, and frequently less, than what was given in<br>former times. Many observers have seen in these facts a clear proof of a<br>reckless and soil-exhausting method of cultivation. It may, however, be<br>doubted whether the effects are practically as bad as they at first appear.<br>The long tap-roots of the indigo prevent the plant from trenching- on the<br>food-supplies of other crops which follow or precede it, and after the<br>indigo is reaped the decaying roots and stalks when ploughed into the<br>ground constitute a distinct accession of wealth to the surface soil-bed.<br>This seems the only possible and natural explanation of the phenomenon<br>that the sterility predicted in canal-tracts from the cultivation of indigo | 202<br>Irrigation.<br>203               |
| has not occurred in any material degree."<br><i>Seasons.</i> —In these Provinces "Indigo may be sown either in the<br>spring (March and April) or at the commencement of the rains. In the<br>first it is called <i>Jamana</i> or <i>Chaiti</i> , in the second <i>Asarhi</i> . The former is ready<br>for cutting in August, the latter in September. The stumps of <i>Asarhi</i><br>indigo are often left in the ground till the following rains, when they spring<br>up again and yield what is known as a <i>Khuntt</i> or <i>Ratoon</i> crop. The<br><i>yamana</i> system is commonly followed in the Doab, but in the Benares<br>Division much of the indigo is sown in June ( <i>Asarhi</i> ), In some parts of<br>Gorakhpur indigo is sown in October with Brassica juncea (Indian Mustard,<br><i>lant</i> ) on alluvial land. The mustard is said to protect the crop in winter,<br>but the area under this mixed crop is limited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Seasons.<br>204                         |
| Method of Sowing and Quantity of Seed to the Acre "Seed is sown<br>broadcast and is mixed up in the soil either by ploughing lightly with<br>the native plough or by passing the long clod-crusher over the field.<br>The quantity usually applied is 15ft to the acre. It is essential for<br>germination that the land must be thoroughly moist and the seed must                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Sowing.<br>205                          |
| not be buried deep."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reaping.                                |
| <i>Reaping.—"</i> The plant is fit for reaping just when the flowers appear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 206                                     |
| L. 2C6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         |

I. 2C6

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|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDIGOFER.        | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| CULTIVA-<br>TION. | It is reaped with sickles, generally on contract, the cutters receiving one                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| NW. P. &<br>OUDH, | <b>pice a ewt</b> ."<br>The Benares Division of these Provinces is practically an extension $t_{1} - t_{2}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | the indigo tract of Behar— the most productive area. In the atom the indigo cultivation is conducted efficiely with verify of an tailor of an tailor of the second  |
|                   | the Benares Division of these Provinces is practically an extension $a_1 d_1 v_1$<br>the indigo tract of Behar— the most productive area. In the $a_1 d_1 v_1 \wedge t_1$<br>indigo cultivation is conducted entirely white verify or matainer $a_1 d_1 v_1 \wedge t_2$<br>west of Allanabad (the so-called Doab of commercial returns) more<br>follows the path of the canal. Thus in the Agra Division the .» $t^*$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   | much indigo while Muttra and Agra which till lately had no can                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   | irrigation, had very little indigo. So also Cawnpore, a district of A <sup>w</sup> uch<br>abad Division, with canal irrigation has three <sup>A</sup> or four times as m <sup>w</sup> uch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Profits,          | indigo as Fatehpur and the Allahabad Districts.<br><b>Profit of Cultivation 2 yield of Plant and of Dye per acre.</b> In the report<br>furnished thy The Division of Total " Protocol and Atminished the fail Wink                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 207               | furnished by The Director of Tand" Records and Aggive hume the foild Wink information is given regarding the cost of cultivation :— "The average of cultivating an acre of Indigo for plant to be followed by a rabt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                   | amounts to R15-8 in the case of Jamana indigo, watered from ^ ^ J,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| ,                 | lift, and Rn-3in the case of <i>Asarhi</i> . The average outturn of <i>"Thermonic of plant amounts to 80 cwt. and of Asarhi to 60 cwt. per acre. The price of plant varies considerably from year to year, and according as the <b>bargain</b> 10 structure of the time of hermer is</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | alled <i>badni</i> ; its price is generally fixed at a favourable rate to the <b>buyer</b> ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | who has, however, to advance the cultivator about half the stipulate $a^{-1}_{gg}$ of his produce to enable him to get on with his cultivation. The lapling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | called Khush kharid, that is to say, the cultivator has the option of sen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                   | vary more than Rio per cwt. The former system is dying out in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                   | districts, for, though the factory owner apparently gets the piar 1 the cheaper rate, yet he often suffers heavy losses by cultivators leave in the bt. village and settling in another whenever they find themselves in the settlement of the settlem |
|                   | In the long run the <i>badni</i> costs him no less than <i>Khush khartd</i> pure <b>lab</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | profit of R12-8 in case of Jamana and of R9-13 in the case of $A^{AS}$ ? (for of Messrs. Duthie and Fuller (in Field and Garden Crops) give $e^{ne} 7 e^{ne} r_{rs}$ t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                   | plant for Jamana 80 maunds per acre and Asarhi a little less the<br>year but equal to Jamana the second, and these authors put down the<br>of cultivation of Jamana land at P15.7. Sin E. C. Puels (in Dues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | Tans of the North-Western Provinces) says: "The outturn of moi?"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   | varies : as much as 80 to 120 maunds of plant per acre may be cut<br>the factory : but the cultivator <b>eutling tor</b> his own rough many for second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                   | the factory : but the cultivator <b>culting tor</b> his own rough manufatture *, "<br>perhaps cut as little as 50 maunds of plant, leaving the stalks for seed."<br>Sir Edward gives the cost of cultivation by well irrigation at R41-2, by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | diary crops, the acre produce is given as worth R47-2, thus showing a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Yield.<br>208     | As to YIELD of dye the Director of Land Records and Agriculture wn ^                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                   | —"The yield of dye varies from 15ft to 30ft per cwt. of plant, *y y highest in years of moderate or light rainfall and lowest in years 01 ne "77 rainfall." There would appear too be acterizable croorinnthis state?nem^*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                   | in a further passage the yield is spoken of as three maunds of dye tr<br>1,000 cwt, of plant or 1 in 500. Messrs, Duthie and Fuller say the yield                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                   | from the acreage yield of plant which these authors give, 18 to $20m^{\circ}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                   | dye would be obtained. In Sir E. C. Buck's work the opinions of several planters are given as to the yield of dye. A vat holding 75 maunds gave                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| i                 | as a rule 6 to 7 seers of dye, e.g., 14ft from 6,000ft or 1 in 428., Another I. 208                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| The multiple rand of Commerce. (O. Wall.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | DIGOFERA<br>inctoria.                      |
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| writer gives his result as 12 seers of dye from 100 maunds, e.g., 1 in 333 :<br>another 100 maunds of plant to 8 seers of dye, and still another 119<br>maunds to 8 seers. One writer gives the results of careful observations<br>extending over 13 years, in which the mean yield was 1 in 426 for<br>European factories and about 1 in 300 for Native. Mr. Liotard speaks<br>of natives obtaining £lb of dye from 1 cwt. of plant or 1 in 224, while<br>Mr. Reid (in his <i>Culture and Manufacture of Indigo</i> ), who says little<br>of a definite nature regarding the yield of plant or dye in Bengal, gives<br>the average in the North-West Provinces as 300 maunds of plant<br>to one maund of dye. Speaking of the impure indigo or gdd, so largely<br>prepared in the North-West Provinces and many other parts of India (for<br>local use), Mr. Reid remarks, 100 maunds of plant will as a rule yield the<br>planner 2  maunds of gdd. He speaks also of one katcha bigha (about  <br>acre) as yielding 15 to 20 maunds of plant. From these facts it would<br>appear that the acreage yield of dye would be about i8Bb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CULTIVA-<br>TION.<br>NW. P. &<br>OUDH.     |
| III.—PANJÁB,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PANJAB,                                    |
| Indigo is said to be grown more or less in all districts except Simla,<br>Kangra, Amritsar, Gurdaspur, Sialkot, Gujranwala, Jhelum, Rawalpindi,<br>Peshawar, and Kohat. The chief seats of the Panjib indigo industry are,<br>however, in Multan, Muzaffargarh, and Dera Ghazi Khan. It is entirely<br>grown on irrigated land, but a strong prejudice exists against excessive<br>irrigation; hence lands subject to river inundation are considered unsuited.<br>Mr. Baden Powell gives much interesting information regarding Panjáb<br>indigo, and mentions that it is produced in two of the districts above<br>(Sialkot and Amritsar), which in recent official reports are shown as not<br>producing it. Mr. Baden Powell gives the seed per bigha at 6 seers for<br>the early and 8 seers for the later sowings. The Director of Land<br>Records and Agriculture has furnished a report which embraces the<br>main facts obtained from the three chief indigo districts. On the subject of<br>methods of cultivation he writes :— <sup>n</sup> The land is usually prepared during<br>the COLD SEASON after the winter rains. It receives about four PLOUGH-<br>INGS before the seed is sown and none after. The more labour thus<br>expended the better the crop; but there is no ploughing for the second<br>year's crop obtained off the stems left in the ground from first year's crop.<br><i>Seasons of sowing.</i> —•" The seed is sown from 1st March to 15th May.<br>It is customary to make fresh sowings every year, but sometimes a second<br>or even a third year's crop is obtained off the same plants. The crop | 209<br>Ploughing.<br>210<br>Sowing.<br>2IX |
| takes from three and a half to four months to ripen, before it is cut. To sow<br>the crop the field is first flooded and the seeds then scattered broadcast on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                            |
| the water. This practice is followed to ensure the seeds sinking into the ground, and that none may remain exposed to the sun. For a month after sowing the field is irrigated every third day or until the plants are a foot high. Irrigation is then given every eighth or tenth day. When the plants are young water is given only in the evening, and then only sparingly, for fear of their rotting from standing in water heated by the sun. Even when older and stronger, the nicest discrimination is required in regulating the supply of water. An over-supply causes the leaves to turn yellow. Continued heavy falls of rain do much injury and often destroy the crops.'' ^ '' For the second year's indigo, less irrigation will suffice, the crop being watered every eighth or tenth day; but the watering must take place early, if possible by the 15th April. First year's indigo requires in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Irrigation.<br>212                         |
| all from 18 to 20 waterings, second year's only 13 to 14."<br>Manure " is not generally used."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Manure.                                    |
| Weeding " is, however, common either by hand or by causing sheep<br>or goats to pasture on the fields."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 213<br>Weeding.<br>2x4                     |

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I. 214

| INDIGOFI<br>tinctori                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CULTIVA-<br>TION.<br>PANJAB.<br>Reaping.<br>215 | <b>Reapin</b><br>ber. It is Cl <sub>tc</sub> $\wedge$ d ig 0 is read y for cutting from 15th July to 15th Septem-<br>K the flowers f?H Su <sup>V</sup> TM it has been twelve to fifteen days in flower,<br>smalf. T s $\uparrow$ d e and b ome yellow before it is cut, the outturn will be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SIND, fee.<br><b>216</b>                        | where it remains $\sinh h$ (in the $\hbar c$ where it remains $\sinh h$ (in the $\hbar c$ where it remains $\hbar c$ (in the $\hbar c$ constant) of the $\hbar c$ (in the $\hbar c$ constant) of the $\hbar c$ (in the $\hbar c$ constant) of the $\hbar c$ (in the second constant) of the constant of the second constant of the constant of the second constant of the se |
|                                                 | <b>n</b> t <b>D</b> . <b>c</b> O <b>k</b> SJ <b>*</b> ?TM <b>*</b> the SIND Ind <b>o</b> is <b>obtained</b><br><b>from</b> ^ C S <sup>L</sup> wfld Spe <sup>r</sup> cie? Of 19 Cie <b>*</b> > < <sup>**</sup> . I- cordifolia, <i>ffeyne</i> , and<br>torS. H^ireed thl ,,? <sup>th</sup> ? <sup>cul</sup> vivated !* «», a r«W crop, is I. time<br>European of fi L . Jnecessity of an effort to have the plant grown by<br>hope <sup>r</sup> to re? ove ^ sToe <sup>See</sup> J <sup>ned</sup> to have been confident that Sind. might<br>reconcident conductor <sup></sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                 | respondent conduct $hight = 0$ and $hight = 0$                                            |
|                                                 | sow a bigha of Und A $v \wedge h$ , that one kusa of seed suffices<br>valued at the a v S; rate J $_{5}$ per maund or R i-10 per seer. Mr.<br>furnishes a most i S S S end S $\int_{1}^{ar} P_{11}r(i)$ the Papers alluded to $h$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                 | George wood SC «I « $\Lambda$ R Flu per seer. Wir.<br>furnishes a most i S S S e l S $\Gamma_{accom}^{ar}$ Pur (in the Papers alluded to $\Lambda$<br>of indico culvation and manufacture. For a thousand bundles of plant<br>wood says the cultivator receives R125, and that quantity would<br>reports, stated that there could be nQ) doubt as to the capabilities of Sind<br>mentioned, but of the Gazetteer of Sind indigo is frequently<br>"Indigo was first tult vated in 1850, and may now be considered one of<br>its chief products, as the soil of the lacebabad Talua in several parts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                 | its chief products, as the soil of the Jacobabad Taluka in several parts<br>is said to be admirably adapted for the cultivation of this dye." Mr.<br>generally ?n May and June, the land being weeded is moistened.<br>It is then ploughed two or three times, and the seed after having been<br>requires three kasos of seed after my inght. Is we broadcast. Each acre<br>for three days or until th T $\uparrow$ t errowing the land need not be watered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                 | young plants awl watered $^1$ schmad $^2$ . Vegetation having begun, the weeks & till S e p t e m b e n n l ? and »«• » contin V <sup>forte n</sup><br>A second year's crop is raised after cuting by watering the old plants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                 | besides indigo, the corol is also obtained, by leaving at the time of reaping<br>one plant untouched at every four or five feet distance. These solitary<br><b>Non-Mark Solution</b> and the begin of the begin of the solitary<br><b>Non-Mark Solution</b> and the begin of the begin of the begin of the solitary<br><b>Non-Mark Solution</b> and the begin of the begin of the begin of the solitary<br><b>Non-Mark Solution</b> and the begin of th             |
|                                                 | <b>rou</b><br><b>i u</b><br><b>i</b> $2^{\text{Cal}}$ <b>d</b> $y^{\text{ers}}$ The writeT $\overline{\text{mL}}^2$ w> <sup>d</sup> indigo being regularly used by<br><b>i d</b> .ndigoes, and in two?nst <sub>a</sub> <sup>A</sup> ?/" <sup>e</sup> A <sup>rt</sup> *° P <sup>rocure sam</sup> P'es of these<br><b>i</b> os «pa <sub>nciflowo</sub> <b>P</b> "twoinstances (from R.ijputana) a variety of Teph-<br>>n Gujarat the s a m $e^{A}$ " $A^{R}$ * TM f «£ as wild indigo. At Palanpur<br>Ported t0 be e«remely aBundant, and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| Political Agent is believed to be presently endeavouring to establish there<br>an indigo industry. In Merwara Mr. Duthie found four species of Indigo-<br>fera growing wild; of L argentea var. ccerulea, he says that it is on the<br>Aravalli hills known as <i>nil</i> . The extent to which indigo cultivation is actu-<br>ally carried on in Rájputana cannot be discovered, but in the Gazetteer<br>it is mentioned in a lisi of the chief <i>khdrif</i> crops of Bundi. In a special<br>report on the dye-stuffs of Ajmir, Pandił Bhag Ram says: •« The<br>average 'approximate extent of indigo cultivation for the last <i>five</i> years<br>may be stated at about 500 <i>bighas</i> per annum. Wild indigo is more<br>or less spontaneous in all the forest tracts. It is cultivated chiefly in<br>the lands of Srinagar, Rámsar, Gangwara, and Kikri by native dyers, to<br>meet their own requirements. In the hill jungle of Rájgarh it is found<br>to gnjw spontaneously, which would seem to indicate that the land is fully<br>adapted to the cultivation of indigo; but it is to be regretted that the agri-<br>cultural classes take little or no interest owing to the difficulties with which<br>the dye is extracted. This circumstance accounts for the scanty supply<br>raised in the districts and the total absence of regular indigo factories<br>The Pandit then states, however, that the cultivation leaves a "very small<br>margin for profit." He remarks that it is grown on <i>bardni</i> land, which is<br>ploughed twice or thrice and then levelled. "The seed is sown broadcast<br>early in the month of June, or as soon as the rains set in. When the young<br>plants are above ground, the grass that grows with them is weeded out<br>by the process of hand-hoeing, which is performed about four times. The<br>reaping season commences in October. | CULTIVA-<br>TION.<br>SIND.   |
| Qf the indigo of the CENTRAL PROVINCES very little has been reported.<br>It is mainly grown in the districts of Sagar, Damoh, Narsinghpur, and<br>Nimar, but it seems probable there are not more than 150 acres annually<br>under the crop. The method of cultivation appears to be similar to that<br>in the North-West Provinces. In Sagar the sowings take place in July or<br>August, and the plants are cut when they attain the height of 2 to 25 feet.<br>In Damoh and Narsinghpur the fields are ploughed twice in June; the<br>seed is sown broadcast. The plants are cut in October, and dried and<br>stored. The roots are, however, left in the ground and yield a second<br>and a third year crop, after which they are dug out. In the Upper<br>Godavari, the seeds of the wild indigo, which abounds in this district,<br>are sown at the beginning of the monsoon, and the leaves are picked<br>during the month of September. These plants yield dye leaves for three<br>seasons, and thereafter fresh ground is cultivated. The ground is ploughed<br>twice and is not manured. Mr. Liotard, from whose report on Dyes and<br>Tans the above passages regarding the Central Provinces have been com-<br>piled, adds that according to the local officer," the leaves of the wild indigo,<br>in the neighbourhood of towns and villages, yield a finer dye than the<br>cultivated indigo, because the plants grow up much further apart when<br>left to themselves and are more luxuriant."<br>The writer has had occasion to point out that such references as the<br>above to \yild plants may probably, when carefully investigated, throw<br>much light on the plant, which might be called the original <i>Nild</i> of Sanskrit<br>authors, but there is nothing to justify the opinion that they would prove to<br>be Indigofera tinctoria.                             | CENTRAL<br>PROVINCES.<br>2X8 |
| VBOMBAY.<br>In 1787, Dr. Hove described the cultivation of Indigo in Gujarat as                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | BOMBAY.<br>219               |

In 1787, Dr. Hove described the cultivation of Indigo in Gujarat as follows: "The indigo was partly inter-sown with cotton, and on some plantations with millet and other grains. The lines were divided about 16 inches from each other, in which the cotton shrub stood pretty thick; the above-mentioned grains were scattered without the least regularity. I

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| INDIGOFER<br>tinctoria       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| CULTIVA-<br>TION.<br>BOMBAY. | Ul er<br>se 2 son A dr r n Athe plapterS * at the, suffer the Migo to grow for two<br>seasons and commonly have three crops a year. The first crop was<br>afready removed (N ovember 25th) and on the lower plantations the second<br>was just being cut. 1 he third crop is inferior and is not ready before the hot<br>season sets in " A TM for d ing to the author of the Broach Gazetteer, even<br>"Cambay it is said the cultivation of indigo has of late greatly fallen off.<br>Hindu peasants dislike growing it, because in making the dye much insect<br>do not Hina "V V «r" ans, with whom this objection has less force <sub>f</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                              | piougnea more than once, and if 2005kit insultry. The sech is seven in<br>both is from the torphan or drill flough. A merthe plants have Come ng<br>in contant weeding for required. There preaches maturity in September, and<br>to we will all mitching the source of the seven and the seven representation of the seven is<br>in the D in the preaches maturity in September, and<br>owing to the great expense of preparing if for the market.<br>Muring the rains and lasts two and sometimes three seasons generally without<br>on the seven in the great expense of preparing if for the market.<br>Muring the rains and lasts two and sometimes three seasons generally without<br>on the seven in uly in carefully tilled ground. It can be three cut<br>being watered. On account of its mixture with wood ashes, Khandesh<br>indigo classes rather low. The first cutting takes place when the plant is<br>on other emonths o.d : the second year another crop of leaves is cut from<br>ploughing the tain and preparing it for some other crop. Some cutti-<br>tion of the great region in the ground a year longer in order to gif a<br>bourhood of Faizpur good indigo is rained. : ". "Convident but in the neigh-<br>bourhood of Faizpur good indigo is rained. : ". "Convident but and<br>the decime thrin the result and other Gujarat market."<br>The Director of Land Records and Agriculture, in his Report for<br>marrating the decime thrin the set of the second per set on the Gazetters<br>and will be found uthave ht?. If the per an second in the paragraph under<br>bourhood in the order of the second wear and there are rectain features of the Boom-<br>to have obtained Fig. If the second have a second per set is to resuscitate the<br>Gujarat The Second for the second per set in the grant of the figure<br>the heading of "History of the second second and Agriculture, in his Report for<br>hards the decime thrin the second second and the grant and the Gazetters<br>indige frader S i we then would alve be end specially interesting<br>only be transformed three the second per second per second per<br>the same time to the second per second per second per |

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| followed in the other indigo localities. There may be other peculiarities<br>still surviving of the early methods of cultivation and manufacture that<br>would prove instructive. It is significant of the migration from Bombay<br>to Bengal, that a similar migration has recently taken place from Bengal to<br>the Upper Provinces. In Tirhút and the Benares Division of the North-<br>West Provinces the greatest yield is obtained, and in these regions indigo<br>cultivation is not only carried on more extensively but on more scientific<br>principles, it would thus appear as if Indigofera tinctoria had only just<br>reached the region of India most suited to it—a region u here there is no<br>record of its ever having been grown by natives prior to the European mo-<br>dern efforts, still less of its ever having existed as a wild plant. The infer-<br>ence is, therefore, pardonable, that had it been indigenous to India it would<br>most probably have existed from time immemorial in Tirhút and Benares.<br>Experiments in cultivating indigo have recently been made at Junagad<br>in Kathiawar, and the results seem fairly hopeful. That the Bombay<br>Presidency could produce good indigo seems abundantly proved by the<br>large exports that once took place—and these the earliest recorded exports<br>of the dye as made by the Honourable East India Company—from Surat,<br>Ahmedabad, and Bombay nearly three centuries ago.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CULTIVA-<br>TION.<br>BOMBAY. |
| VIMADRAS.<br>The Director of Land Records and Agriculture has furnished a series<br>of most instructive reports on the Madras Indigo industry, from which the<br>main facts given below have been derived. In one of these Mr. Mac-<br>leane, Collector of Nellore, writes :—'' Indigo cultivation extends along<br>the east coast from Kistna to South Arcot and inland to Kurnool and<br>Cuddapah. Cuddapah is the principal district for indigo : next Nellore.<br>The crop requires a rich friable soil, neither too moist nor too dry.<br>Bright sunshine favours the development of the dye principle, but fre-<br>quent rains cause a more luxuriant growth. It is generally cultivated as<br>a dry crop. In some parts, it is sown mixed with millet crops, and after<br>the latter are harvested, the indigo shoots up. In dry land, as a rule,<br>one cutting is obtained in October and a second in January. Indigo is<br>also, however, grown on wet land. Here two cuttings are certain and<br>sometimes even a third. It is not unfrequently sown in paddy fields a<br>few days before reaping. On whatever soil sown, the crop, so far from<br>exhausting, is believed to strengthen the soil. The first step in its cul-<br>ture is to plough and manure the ground. A flock of sheep is sometimes<br>enclosed on the ground. At other times the ground is lightly scattered<br>with wood-ashes, cow-dung, &c, or the refuse of the indigo plant from<br>the steeping-vat, or its ashes, are scattered over the fields. The seed is<br>generally sown broadcast. The plant in favourable damp weather, or<br>if lightly-irrigated, makes its appearance above ground in four or five<br>days and ripens in about two months and a half. Great care is taken<br>to weed the plantation thoroughly and to keep the ground moist, but not<br>to weet. When the seedlings attain two or three inches, the fields are<br>weeded. The leaves are cut just before the plant flowers. The first<br>cutting takes place when the crop is three months' old, after which the<br>field is lightly ploughed. The other cuttings follow after intervals of two<br>or three months and are better than the first. | MADRAS.<br>220               |

Other two reports give particulars regarding South Arcot, Kistna, Cuddapah, Kurnool, and Vizagapatam. Regarding Cuddapah, Mr. Sewell writes:— Dry cultiva-tion.

Dry Land Cultivation.—<sup>1</sup>\* After the land has been moistened by

| NDIGOFERA<br><u>tinctoria.</u> | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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|                                | rain it is ploughed and manured. If the April rain is sufficiently<br>heavy this is done then. If not, in July or August, The ground,<br>loosened by <b>ploughing</b> , is allowed to remain unsown for a few days until the<br>next heavy showers when the seed is sown in rows by drills followed by a<br>roller. It sprouts in about three days. In about a month weeding com-<br>mences, which is done by labourers with a sort of spud. On dry lands the<br>crop is entirely dependent on rainfall. The first cutting is taken irong<br>three to five months after sowing, the interval being shorty if rain a<br>abundant and frequent, and longer if it is scanty. At intervals of aDOU<br>three months after the first cutting of the leaves a second and third culture we<br>is taken. It is not usual to attempt to take more than three crops, on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Wet cultiva-<br>tion.<br>222   | is taken. It is not usual to attempt to take more than three crops, on<br>the plant is allowed after the third cutting to seed."<br>"Wet Cultivation.—This is either under tanks or wells. Under weigh<br>the water supply of which is certain, the cultivation is commenced $i^*$ . Mar<br>or April. The land being constantly under cultivation, if the soil is loos<br>the seed is sown without any previous ploughing, which is, in such cas<br>thought injurious: otherwise under tanks the land is watered, the<br>ploughed and smoothed by a roller. The land is then manured either wut<br>cow-dung or by penning flocks of sheep on it for two or three days,<br>is then watered, and when it has dried again ( <i>i.e.</i> , in three or four day<br>the seed is sown. It sprouts in about three days. If it does not do.sp-t<br>land is watered once to make the seeds germinate. The crop is the<br>watered at regular intervals of not less than a week, or more thanktwen<br>days. The intervals depend on the rainfall and the consequent state of<br>the soil and atmosphere. Weeding commences a month after sowi<br>and continues at intervals of a month. The first cutting is taken tuple<br>or four months after sowing, and the second three months later; when<br>are circumstances permit the crop to be sown early enough, two <sup>cuttin</sup> j J v<br>taken and the crop is then ploughed in, and a food-crop, usually P agay,<br>grown. Indigo is not geown continuously on the same land but is; all of<br>nated with paddy. The refuse of the indigo-vats is much prized a "<br>manure both for indigo and other crops." J-^Q.<br>Having thus dealt with the methods of cultivation in the two chief in dig<br>producing districts of Madras little more need be said. To complete in<br>account, however, a few passages may be here given from Mr. 0. Kougn<br>description of Indigo cultivation in the district of Kurnúl which mayhe <sup>tak</sup> .<br>to represent the districts in the Presidency where indigo is of less import-<br>ance than in Cuddapah and Nellore. The plant, Mr. Kough says, is-a<br>biennial, but is sometimes kept growing for three years. It is sown in<br>black cotton un |
|                                | cuttings lasting into the next season, <i>viz.</i> , two in the first year and the region in the second. Indigo is also grown on land artificially irrigated. When the second is cultivated in paddy land, it is sown in January or February, after the prese paddy crop has been harvested, and one or two cuttings are made be *99, the end of <i>thefasli</i> , and a third cutting in July and August. After the stumps are ploughed up for manure and paddy planted; the ray moreover, almost invariably gets back the refuse after steeping, and this ajs he uses as manure." Speaking of the dry land cultivation, Mr. Kougn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                | further remarks:—" The time of sowing must be selected with care, 10,<br>the chance of a heavy fall of rain caking the surface of the ground and thus<br>preventing the young germs from coming through is considerable, but this<br>difficulty having been got over, when once a fair start is attained, there is<br>scarcely any crop more hardy and less susceptible of damage by drought<br>It escapes damage from grazing of cattle, sheep, or goats, as none of these<br>animals will touch it. Thus the soil, climate, and season are the three<br>I. 222                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| <b>I ne Indigo Plant</b> of <b>Commerce.</b> ((1. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | DIGOFERA<br>inctoria         |
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| factors that affect the prospects of the crop. The indigo grown on dry<br>black cotton soil yields dye of a superior quality. The winter crop yields<br>more prolifically than the summer crop. "Weeding/' Mr. Kough re-<br>marks, " is sometimes done by the drill, at other times by hand. The crop<br>is cut four months after sowing when the plants begin to blossom. Two<br>acres fair growth yield about three tons in the first cutting, and will give<br>four or five cuttings, of which the first and the last are usually the least<br>heavy." 3 He gives the cost of cultivation at R14, the price paid for the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CULTIVA-<br>TION.<br>MADRAS. |
| produce as R20, and the profit, accordingly, as R6 per acre.<br><i>Cost of Cultivation: Field of Plant and of Dye,</i> —In the official<br>reports of the Saidapet Farm a slightly improved process of cultivation is<br>recommended in which the crop is drill-sown after deep ploughing. The<br>danger of the surface soil getting hardened by evaporation after rain,<br>before* germination sets in, is strongly urged. If the sowing takes place<br>in November, the crop will be ready for cutting by the beginning of March.<br>An acre at the Farm was found to yield 200 bundles weighing 12,000ft,<br>and to be worth to the cultivator about R30, giving R10-3-0 an acre as net<br>profit. An acre of land yielding 12,000 ffi of plant was believed to afford<br>2 maunds of dye worth R90, but the report on Cuddapah quoted above<br>states that a fair yield of dye would be 1J to 1} maunds per acre. Of the<br>Kistna district it is said that the net profit per acre on two years' cultiva-<br>tion of indigo plant is R20-8-0. In Nellore 100 bundles of plant are said<br>to give one maund of dye; and in the Kurnul report it is said that ?ID<br>of dye is obtained per cwt of plant. In Bellary, however, the yield of dye<br>is given as only J maund per acre. The Madras maund equals 24*68Ib or<br>in mercantile usage 25ft. It seems probable that these estimates of yield<br>of dye to the acre of land are very much overstated even were a deduction<br>of 50 per cent, made for weight of adulteration. The yield for the Presi*<br>dency obtained by dividing the total production by the ascertained area is<br>only 9'5tb an acre, and this is probably not far from correct. | Cost.<br>223                 |
| VII.—BURMA & ASSAM.<br>In a communication from the Political Agent, Mandalay, dated 1872, it is stated that Indigo cultivation was first commenced in that part of Burma in 1P60, when the King of Burma procured manufacturers from Bengal to teach his subjects the art of preparing the dye. Four factories were established. His Majesty required his subjects to sow a third share of their land within the vicinity of the factories when the land in question was found suitable. It is remarked that "Indigo made from the Burmese f'lant, indigenous to the country, is found not to be equal to the Bengal ndigo." Seed was accordingly annually imported. The Chinese merchants of Mandalay purchased the indigo produced, and exported it to the Shan States and China. It is said to have fetched Rioo per 4^ maunds. Dr. Mason ( <i>Burma and Its People</i> ) says that Indigofera tinctoria, the <i>mat-nay</i> or <i>shan-mai</i> , is much less extensively used as a source of blue dye than Strobilanthes flaccidifolius, the <i>mai-gyee</i> , or than Marsdenia tinctoria. ~An " indigenous shrub," a species of " Indigofera," he remarks, is also sometimes used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BURMA.<br>224                |

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is also sometimes used. In a recent communication on the subject of Indigo cultivation in Burma, it is said to be grown in the Lower Chindwin district. ° There are two crops—the wet weather and the dry weather crop. It grows anywhere. The ground is ploughed up and the seeds scattered over it. The wet weather crop is sown in June and collected in July and August, and the dry weather crop is sown in October and collected in December and January." In the Mandalay district it is reported to grow wild "and the plant is never used for extracting the dye. It is employed medicinally

| INDIGOFE<br>– <b>tinctori</b> ៖ | The Indige Plant of Commonse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| CULTIVA-<br>TION.               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| BURMA.                          | start*/ K HERP? A this brief notice of Mandalay that the factories<br>That $^{\circ}$ OXi HERPEDotestates that matrix consisting observe abandmoned. Of<br>inar awaddy the peDotestates that matrix consistence based to a very small<br>extent, It is planted in July and reaped in October. The soil is firs<br>dyeing purposes I A amherst "the wild plant is used by the Karens for<br>trif n effect, I is dealed medicinally only."<br>nrninZe e, t, I is used medicinally only."<br>nrninZe for the form from these brief notices that Burma affords a hopeful<br>SriSff- oi becomm S <sub>1</sub> a Sood he <* for Indigo cultivation. Large tracts<br>fa/tnice ne uncultivated, and were European planters to open out<br>connectn will ea might be possible, and if so' the cultivation o indigo<br>would prove highly Kneticial to the<br>pioneers of the new industry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ASSAM.<br>225                   | In Assam nd Ma $\operatorname{ninustry}^{1}$<br>vervmuch aftPrrt $\operatorname{nipUr>AtrobilMtIles}^{11leA}$ «-is regularly cultivated,<br>^ L Thop D D $\stackrel{\circ}{D} \stackrel{\circ}{E}^{A}$ 6 same system as in North-West China. The writer<br>to Weon??h?InFf&o <sup>ni</sup> hil Cal^a International Exhibition Catalogue.<br>he cultivition of thf P ar jers the desi bility of their experimenting with<br>S S n S R -1 i ^ T P vax 3S an addition M source of Indigo. He<br>for! woltabU. in^i resp!C^S li Pousses properties eminently suited<br>finer thin thaj ''^J? <sup>0</sup> '' P and ''' China at lea^t the dye is pronounced<br>$b ^ S ^ M ^ {$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SEED.<br>226                    | CULTIVATION OF SEED.<br>Bengal may be said to d $(15 \text{ a})$ and $(15 \text{ a})$ |

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| The Indigo Plant of Commerce. (G. Watt) IN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | DIGOFERA                   |
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| ready early, <i>i.e.</i> , about the middle of June. The Madras seed yields a crop even earlier than that from the Patna and C awn pore seed. But this is rarely an advantage. The factory operations are dependent on there being plenty of clean water ready at hand, and in May, when the crop from Madras seed is ready for cutting, the rivers are still dry.<br>"The price of seed varies very much, from R4 to R40 per maund." The Collector of Midnapore reports :—<br>"No indigo seed is produced here. The rayats are given 6 seers of seed for each bigha. Last year the seed cost R15 a maund : this year only R5. The high price having induced many to produce it, the supply was greatly increased : hence this decline in price."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CULTIVA-<br>TION.<br>SEED. |
| is reported on as follows :—<br>"SeveVi seers of seed are sown per bigha in the Gya district. In<br>October a portion of the Asarhi and Jamana are left standing for bearing<br>seed. The plants are kept apart at a distance of 6 inches for this purpose.<br>- There are two kinds of indigo seed sown—that grown in the locality<br>known as dasi, and that of the North-Western Provinces, known as up-<br>country; the latter being sown more extensively, especially in the chief<br>concerns to the south and south-east and south-west of the station of<br>Purneah, where little or no dasi seed is sown. The north and north-west<br>and east of the district have few working factories, and in these the dasi<br>is sown in high lands only. For a seed crop it is grown to the west and<br>north-west only; sown in July and August; reaped in December; sells in<br>January; prices vary according to the demand, averaging about R4 to<br>&5 per bazar maund."                                                                                                                                                                                                                                                                       |                            |
| North-West Provinces.—The Director reports as follows on the subject<br>of seed cultivation:—"When the plants remain stunted and do not pro-<br>mise to fetch much by their weight they are reserved for seed and cut in De-<br>cember, when they yield about 6 maunds of seed to the acre. The stumps<br>of a Jamana crop are also sometimes left in the ground for seed, after the<br>stalks have been cut, and yield about 4 maunds of seed to an acre."<br><i>Madras.</i> —Mr. H. G. Turner, Collector of Vizagapatam, writes:—" As<br>the lands in which Indigo is cultivated are required almost immediately<br>after for paddy, there are no opportunities of raising a crop for seed pur-<br>poses." Mr. C. Kough, Collector of Kurnúl, reports:—"Seeds are col-<br>lected in January and February from plants sown in the beginning of the<br>monsoon, and those sown during the previous year. The latter yields more<br>seed. ^ The plant, when the leaves have been cut after the monsoon is<br>over, is allowed to grow for the purpose of yielding seed. With the seed<br>the leaves are also collected and allowed to dry, and when the seed is<br>separated, indigo is extracted from the dry leaf also."<br>DISEASES AND INJURIES. | DISEASES.                  |
| DISEASES AND INJURIES.<br>In a recent circular, calling for information regarding the Indigo cul-<br>tivation and manufacture as presently practised (which the writer issued<br>through the-Revenue and Agricultural Department), the following replies<br>were received regarding the above subject :—<br>Bengal.—Mr. N. G. Mookerji reported to the Director of Land Re-<br>cords and Agriculture that "the crop suffers from the following causes :—<br>In May and June indigo plants sometimes drop their leaves. This is pro-<br>bably due to droughty weather, but it is only some plants that behave in<br>this way.<br>(2) A green caterpillar, about 1" long, when of full size, locally called                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DISEASES.<br>227           |

(2) A green caterpillar, about 1" long, when of full size, locally called *malpoka*, appears when plants are mature. The appearance of this caterpillar is in fact a sign of the maturity of the leaf for cutting. If, however,

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| INDIGOFERA | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|            | the harvest is neglected for a few days, the caterpillar does great harm b<br>eating away the leaves.<br>(3) A big geometridae caterpillar,   " to 2 <sup>V</sup> long, <i>i</i> " in diameter where<br>full sized, occasionally appears just before harvest, and does <sup>considerran</sup> 's<br>damage. The caterpillar maybe just noticed some afternoon for the n<br>time, and the leaf of a whole bigha of flourishing crop may disappear<br>before the next morning.<br>(4) High winds, hailstorm, constant loading and unloading after na<br>vest, soaking in water, or any other circumstances that spoils the<br>injures the crop for the dye. To get the best result the largest qual'n^<br>of leaf must be gathered when mature and taken as quickly as possible                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|            | the factory house.<br>(5) The crop is very liable to blights of different sorts, and is ascroption<br>jured by extremes of either drought or wet. It is also liable to ^'O^y.<br>insects at different periods of its growth, to Injury from hail, and also<br>injury from severe storms of wind.<br>(6) The indigo is a very hardy plant, but owing to the length nt difference<br>required to bring it to maturity—• a period extending, in the case 01-1<br>crops sown in October, to from eight to nine months '—it is very hable-<br>injury from drought and from the high winds which are prevalent dun<br>the months of April, May, and June. A very severe gale of wind last<br>ing some days, will almost entirely destroy a crop of indigo, stripping it,<br>its leaf, and consequently rendering it useless for manufacturing purpose.<br>The Collector of Midnapur reports :—'' The crop is liable to very as<br>diseases. The spring crop is sometimes eaten by caterpillars and 81, en-<br>hoppers. The autumn crop is too old to be generally attacked by <i>in</i><br>insects. The quality of the crop, however, is sometimes destroyed -oy the<br>untimely drought in June, when all the leaves get scorched up, atte as<br>plant has once started its second growth, or by excessive rain which we |
|            | North-West Provinces and Oldlidh-The Director of Land $   < J_{i} < J_{i}$<br>and Agriculture reports that, "In the early part of its growth it is HaDe<br>the attacks of a winged insect called Gadlie which feeds on the 'oJ''<br>leaves. Another source of damage to the plant is continued wet weain<br>which renders it tall and woody without much foliage, and by a kin a,<br>etiolation prevents the proper development of the dye property in **<br>leaves."<br>Panjdb.—The Director in this province writes :—" As above stated to<br>large a supply of water is fatal. Heavy and continuous rain is also i<br>jurious. The plant is also subject to be attacked by certain insects r<br>sembling blight and by the grass-hopper. But if rain falls in modera<br>quantities the insect dies out. Another disease is also common in its early<br>stages from the 15th to the 30th day, brought on by excessive heat an<br>hot winds, which cause the plant to dry up and wither away. Wet-io<br>too are very injurious."                                                                                                                                                                                                                                                                                   |
|            | <i>Madras.</i> — <i>Mr.</i> L. M. Wynch, Kistna district, writes: -'' The indigo <sup>c</sup> cr<br>is said to be liable to the ravages of several insects, amorgst them bein<br>locusts, the <i>gongali purugu</i> , and <i>kambali purus<sup>A</sup>u</i> (caterpillars). A<br>rayats have no means of destroying these insects. The <i>Buddi ttga</i><br>attacks the crop after it has grown up 6 or 0 inches; if this occurs, the crois ruined and has to be left till the following year.'' Mr. E. J. Se <sup>W</sup> f<br>Collector of Cuddapah, in his reply states that, '' At the age of two month<br>the plant is liable to be attacked by diseases known as <i>Budide-rogane</i> , a<br><i>Agut-mandalaputhegulu</i> . In the former case the leaves turn white, in the<br>latter black, and in both they fall off.'' Mr. C. Kough, Collector of Ku<br>nul, alludes apparently to these diseases, but he speaks of a third form<br>I. 227                                                                                                                                                                                                                                                                                                                                                                |

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| - | The Indigo Plant of Commerce. (G. Watt) IN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DIGOFERA                                                          |
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| - |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | inctoria                                                          |
|   | when subject to the first disease the leaves contract and gradually fall off :<br>when to the second the leaves turn white and the plant ultimately decays :<br>when to the third the leaf is covered with white* matter and the plant dies.<br>"While still young, the plant is subject to the attacks of caterpillars.<br>They attack it when germinating. When the plant attains a height of<br>three inches it is almost free from the insect pest."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DISEASES.                                                         |
|   | YIELD, AND AREA UNDER INDIGO.<br>With perhaps no other commercial commodity does the inconvenience<br>of a want of uniformity in weights and measures tell more injuriously than<br>with indigo. The <i>Bigha</i> of land in Lower Bengal is one-third of an"acre;<br>in some parts of Tirhút it is six-sevenths; in the greater part of the North-<br>West Provinces five-eighths; and in many other provinces three-quarters of<br>an acr3. The factory maund of dry indigo is 74ft io oz.; the Madras maund<br>25ft; the Bombay maund 28ft; the Government maund for Bengal, the<br>North-West Provinces, and the Panj£b, 82ft. In this connection it may<br>be remarked that it has been found impossible to discover whether the<br>green indigo plant is purchased in factory maunds or in Government<br>maunds. The calculation of yield of plant to acre has been made on the<br>assumption that the maunds of Upper India given by writers on the<br>subject are 82ft. If this be found hereafter to have been incorrect, an<br>alteration from 82 to 74I will have to be made, but this would not affect<br>the yield of dye, which is estimated on a relation of quantity to a<br>unit. The assumption of the maund being equivalent to a cwt., adopted in<br>certain compilations, has led to the greatest confusion and gross misrepre-<br>sentation. | AREA &<br>YIELD.<br>228<br>The Bigha.<br>229<br>The Maund.<br>230 |
|   | In working out the indigo statistics given in this article, the attempt has<br>been made to reduce areas to acres and weights to pounds, but the writer<br>is conscious he may have made some mistakes from the difficulty experi-<br>enced with local returns in determining the system pursued by the original<br>authors. He has, however, corrected these weights and measures with<br>some degree of care, and is hopeful that his results will, on the whole, be<br>found to convey a fairly accurate statement of the indigo industry of<br>India. With regard to yield of dye per acre of crop the very greatest<br>difficulty has been encountered. This has arisen not only from the causes<br>indicated above, but through numerous inaccuracies in the returns, and<br>from a possible desire to avoid definite statements on the part of those<br>most interested. For example, the range of variation of yield of dye has<br>been found to be from 41b to 150B) an acre. Such a discrepancy is<br>obviously due to inaccuracy in compilation or to want of definite in-<br>formation, and not to differences of climate and soil, or method of manu-<br>facture. The writer has arrived at the conclusion that a yield of 12ft an<br>acre for Lower Bengal (and the other non-irrigated tracts, indeed,                                              | ,<br>Dye to Plant.<br>231                                         |
|   | the greater part of India), and of 18 to 20ft for Behar, and certain<br>parts of the North-West Provinces and of the Panjab, would be fairly safe<br>standards.<br>It seens probable that the yield of plant per acre is in direct ratio to<br>the degree of irrigation, but that the quantity and value of the dye                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Plant to<br>Acre.                                                 |

obtained is in inverse ratio. This rather complicates matters, but it accounts largely for th'e greater quantity, though inferior quality, obtained from the canal-irrigated tracts of the North-West Provinces and the Panjdb. A further fact of great importance is that with all Native factories, increased yield is due to two causes: (a) the extraction from the plant of a greater amount of organic but non-indigo materials, and (b) the

\* [Probably a species of Periospora.-Ed.]

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| The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| systematic adulteration that is practised. The greater weight of indigo<br>obtained from an acre of land by the Native as compared with the Euro-<br>pean methods of manufacture has its explanation in these facts, but its<br>consequence in lessened value. After a consideration of all the facts<br>brought to light by the numerous reports and publications on the subject,<br>it seems safe to infer that the production of indigo by the .European<br>factories varies from 1 in 340 to 1 in 640, the average being $a^{\circ\circ u}$ 1 of dye from 420 of plant. These extreme variations are, due to two<br>causes—the difference in the dye-yielding property of one year's crop a <sup>o</sup><br>compared with another, and the difference already alluded to between<br>indigo plant from canal-irrigated land and that from non-irrigated lana.<br>With native manufacturers the range is 1 in 220 to 1 in 330. Accepting<br>these figures as factors to estimate the yield of crop per acre, we <b>obtain</b><br>for Lower Bengal 420X12=5,040^{^}, and in 'Behar and many parts of <b>the</b><br>North-West Provinces 420 x 20=8,400^{^}. These results are <b>e perf</b> ,<br>ent doubtless on test cases (obtained by well-known factories) and may<br>not be applicable absolutely to every case. On turning, however, to the<br>published figures of actual yield of green plant to acreage, it is found that<br>the above estimates correspond remarkably. Thus, the average 01 ai<br>returns gives the yield as ranging from 50 to 80 maunds, the maximum<br>being 120 maunds to the acre. These returns would therefore be 50 X 82-<br>4.ioofcj 80X82=6,560^{^}, or 120x82=9,840tb of green plant to the<br>acre of land. The lesser quantity of plant required by the native manu-<br>factories for all estimates of outturn per acre. But the application of<br>this system of calculation can be made with safety only where the parts of<br>the system of calculation can be made with safety only where the parts of<br>this system of calculation can be made with safety only where the parts of<br>practised. For example, it would be unsafe to assume that an aver<br>of 20ft an acre was produced in the No |
| the weight of dye. Indeed, in many parts of India, a large trade is done<br>in preparing and selling the peculiar clays that are mixed with the liquid<br>dye, preparatory to its being made into cakes and dried. A much more<br>correct estimate of yield is 25ft of dye to 73 cwt. of plant, or 1 in 3 V <sup>4</sup><br>and that is the yield stated by several writers on the indigo industry of the<br>North-West Provinces; but of course it is the yield of good indigOi not 01<br>the highly-adulterated stuff.<br>Perhaps the earliest attempt to estimate the area of land under Inaige<br>in Bengal was made by the late Dr. H. McCann {Dyes and Tans of<br>Bengal}. His figures were compiled from the reports of local officer<br>furnished in connection with the formation of the Economic Museum<br>Dr. McCann arrived at the conclusion that in 1877-78 there, were <sup>03</sup> 705<br>(or as subse uently quoted in round figures, 700,000 acres of land under<br>indigo. A more recent estimate published in the Statistical Atlas fives<br>the area in 1884-85 as having been approximately 1,300,000 acres. It, w<br>apply the mode of testing these figures given above, the Bengal produc-<br>tion in 1877-78 would have been thus—Behar 297,716 acres, giving 20iD<br>an acre, and Lower Bengal 340,240 acres, giving 12ft an acre, or a totai<br>of 10,037,200ft. The writer has no means of analysing the second esti-<br>mate to discover how much was regarded as Behar, and how much Lower<br>Bengal, but assuming that only 12ft an acre was obtained all over, the<br>I. 233                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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| (f, y)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DIGOFERA<br>nctoria          |
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| production in Bengal for 1884-85 would have been 15,600,000ft. According to Messrs. Thomas and Co., the actual production in these years was respectively 3,832,605ft or 6ft an acre to McCann's area, and 5,351,806ft or 4* 1 ft an acre to the <i>Statistical Atlas</i> area. It would thus appear that either the area as given by McCann and the still greater area in the <i>Sta* tistical Atlas</i> must have far exceeded the actual area of the years in question, or that the average yield per acre must have been about one-third of what the writer believes it to be. Applying the test of 12ft an acre for Lower Bengal and 20ft for Behar, the area under indigo in Bengal, calculated from Messrs. Thomas and Co.'s returns, would have been 232,682 acres in 1877-78, 316,914 acres in 1884-85, and 401,302 acres in 1887-88. The average of these acreages is probably much nearer the actual ^rea under the crop than either of the above which have been accepted as correct by most recent writers. It is probable that these accepted areas of Bengal indigo were dependent on some calculation based on the Bengal trade in the dye—a trade which drains GO per cent, of the North-West, together with a certain amount of the Panjáb, Rajputana, and Central Province indigoes. There being no available agricultural statistics for Bengal, it may serve a useful purpose to test the accuracy of the estimated area of 401,302 acres for the year 1887-88. According to the agricultural statistics of the provinces of Upper India, the following were the areas under the crop during the year 1887-88 :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | AREA ft<br>YIELD.<br>Bengal. |
| Acres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |
| Panj&b<br>Central Provinces                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                              |
| The bulk of the indigo produced in cakes is exported, and the Gov-<br>ernment returns of exports give the quantities and values that left Bengal,<br>Madras, Bombay, and Sind. These will be found tabulated below<br>(Chapter on TRADE IN INDIGO) for the past ten years. To arrive, how-<br>ever, at an approximate estimate of the actual Bengal share in the pro-<br>duction of the exports, we may analyse last year's figures thus :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                              |
| From Bengal<br>,, Bombay<br>,, Sind<br>, Sind<br>, Sind<br>, Bombay<br>, Sind<br>, |                              |
| TOTAL .<br><u>-10.845.184</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                              |
| The writer believes that, while a production of $20t$ an acre occurs in<br>many parts of the North-West Provinces and possibly throughout Tirhút,<br>for all the provinces (the acreage of which under indigo has been given<br>above), a yield of I2& would be found fairly liberal. For the 397,671<br>acres it may therefore be estimated that 4,772,052ft were produced. By<br>deducting that amount from the total exports from Bengal, Bombay, and<br>Sind, there would remain the Bengal production, <i>vie.</i> , 6,073,1326, and<br>according to Thomas and Co. Lower Bengal and Tirhút produced nearly<br>800,000lb more than that amount, but of course the whole production was<br>not exported. Bengal supplied other provinces and consumed locally a<br>large amount. In fact in the table below showing the balance of produc-<br>tion over exports it will be seen there remained in Bengal 880,640ft in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ·                            |

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| INDIGOFER<br>tinctoria.                    | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AREA &<br>YIELD.                           | 1887-88. During the past five years the North-West Provinces and Oudh have had an average of 397,557 acres under indigo which have produced                                                                                                                                                                                      |
| •                                          | the average of 3,609,029,16 of dye or about 10ft an acre. If the estimated area of Bengal indigo of 400,000 acres (or to guard against any possibility of understating, say 500,000 acres) proves correct, the relatively greater production in Bengal, as compared with the North-West Provinces, shown                         |
|                                            | in the above figures, must be accounted for by the greater acreage yield of Behar, which last year manufactured 5,192,780ft of indigo. *                                                                                                                                                                                         |
|                                            | According to the agricultural statistics of Madras, the Southern Presi-<br>dency had last year 501,721 acres under indigo, the exported produce of<br>which amounted to 4,794,944ft, which (disregarding local consumption)                                                                                                      |
| Total area for<br>all India.<br><b>234</b> | would be 9*5ft an acre. Accepting the estimate of 500,000 acres for<br>Bengal as correct, the <i>total area under the cropfot all India</i> wqpld, last<br>year, have been 1,399,392 acres. The total foreign exports were 15,640,128 <sup>©</sup> ,<br>which shows a total average production per acre of 1 rift, to which must |
|                                            | be added the Indian consumption probably close on 2,000,000ft of dye, <sup>thu</sup> s raising the mean acreage production to i2'6ft. But if the calculated* acreage and actual yield of Tirhut be excluded, the average yield for the rest of India is only io^ft an acre; so that in round figures one-tenth of                |
| Į.                                         | the pounds of dye produced is the acreage of the crop.                                                                                                                                                                                                                                                                           |
|                                            | In conclusion, the writer would add that, although personally satisfied<br>that the above criticism of the published statements regarding yield and<br>acreage will be found far more nearly correct than the opinions hitherto<br>advanced, he is conscious that he has had to be guided by indications more                    |
|                                            | than by direct evidence. Many persons express the yield of dye from $P_{a''}^{a''}J$                                                                                                                                                                                                                                             |
|                                            | as one in so many. But applying the factor thus afforded to find the yieW of plant per acre, in one case it comes out as 2,000ft, in another as i2,000D>. These are the extremes, but in working through many such statements                                                                                                    |
|                                            | every intermediate result has been met with. The yield of dye to acre,<br>where given by writers, is almost invariably twice as great as the yield ob-<br>tained by dividing the total production of the province by the recorded                                                                                                |
|                                            | acreage. It is thus probable that the planters who furnished the figures<br>published by Government gave their own results, and that these are far<br>higher than could be admitted for an average provincial production which                                                                                                   |
|                                            | included Native manufacturers. This error is, however, minimised in such<br>provinces as Tirhut or even Bengal as a whole, where the majority of<br>planters and manufacturers are Europeans, who conduct their operations on                                                                                                    |
|                                            | a uniform and scientific principle, so that the returns published by the few<br>may be accepted as fairly applicable to all. Messrs. Thomas & Co.,. » <sup>n</sup><br>their statement of annual averages, exhibit the relative amounts of Native                                                                                 |
|                                            | as compared to European indigo. Last year, while the latter produced in<br>Lower Bengal 20,946 maunds, the former sent into the market only 1,834<br>maunds. The entire Tirbut production of 69,585 maunds is shown as                                                                                                           |
|                                            | European. A very different state of affairs prevails in the North-West<br>Provinces. Of the Benares indigo, Europeans produced 6,515 maunds,                                                                                                                                                                                     |
|                                            | Natives 5,750 maunds. Of the Doab, the shares were, European 3,ia <sup>°</sup> maunds, Native 24,000 maunds. These facts demonstrate 'why it may be safe to accept the average of 12ft for Lower Bengal and 20ft for Tirhút in estimating area. While some of the European Bengal and 20ft for Tirhút                            |
|                                            | in estimating area. While some of the European Benares factories pro-<br>duce as good a result as those of Tirhut, a yield of 20ft for these provinces<br>all over would be incorrect, as may be seen by the fact that it would re-                                                                                              |
| LAND<br>TENURE IN<br>INDIGO<br>DISTRUCTS   | duce the necessary indigo area by fully one-halt of what is given in the Agricultural Statistical Tables of these Provinces.                                                                                                                                                                                                     |
| DISTRICTS.                                 | SYSTEMS OF LAND TENURE IN THE INDIGO DISTRICTS.<br>Prior to the Muhammadan conquests of Upper India the Hindu law                                                                                                                                                                                                                |
|                                            | I. 235                                                                                                                                                                                                                                                                                                                           |

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| and practice was for the ruler (whether king or petty chief) to obtain<br>a share of the produce of the land. This share was by Akbar converted<br>into a tax or rent, based on an actual survey and settlement, but the assess-<br>ment was fixed for only ten years, and was subject to a revision every de-<br>cade. In South India (which did not fall under Muhammadan rule till a<br>much later period), the Hindu law prevailed, with the modification that<br>the share to be paid to the ruler was often given in cash fixed at the<br>prevailing price of produce. In Bengal, the Muhammadan rulers intro-<br>duced the system of farming out the tax collection to certain individuals<br>who were sometimes the descendants of the original owners, at others mere<br>speculators. During the period of anarchy between the death of Aurang-<br>zeb and the establishment of the British rule, every power which be-<br>came predominant taxed the land to the utmost, and the system of farm-<br>ing out the tax collection was naturally found the easiest and most effectu-<br>al mode of tyranny and persecution. The collector or <i>zamindar</i> obtain-<br>ed the right over a certain district or tract of land from his being<br>the highest bidder, and it became customary to sub-let or even sub-sub-let<br>the <i>zamindari</i> right, until the land had to support not the Government and<br>cultivator only, but two or three sets of collectors, some of whom did abso-<br>lutely nothing but realise a large personal income. The British early found<br>it necessary to reform this system and to restore more or less the Muham-<br>madan method of direct taxation, based on what is called a "Settle-<br>ment" of the land revenue. It was part of the policy also to encourage or<br>develop proprietorship. But the varieties of land tenure found in existence<br>gave rise to three distinct systems of settlement, since the general rule had<br>to be accepted that the person who had the highest existing interest in the<br>land should be held responsible for the revenue. In some cases peasant<br>cultivators paid, as they do now, their land rent directly to the State. | LAND<br>TENURE IN<br>INDIGO<br>DISTRICTS. |
| Bengal, which early came under British rule, was settled under what<br>is now known as the <i>zamindari</i> system. The peasants who cultivated the<br>lands were accepted as having a tenantry right, but the superior holders<br>(the descendants in some cases of ancient families, in others of military<br>chiefs, or only of the farmers of revenue) were recognised as tax collectors<br>in perpetuity on fixed or unchangeable rents. This system prevails not<br>only in Bengal (excluding Orissa) but in the North-Eastern Districts of<br>Madras, in Oudh, and in the Central Provinces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Zamindari.<br>236                         |
| In the greater part of Southern and Western India there was found to<br>exist no superior class between the Government and the actual cultivators,<br>and in the village <sup>^</sup> communities certain families or persons had always<br>cultivated certain fields. The settlement was therefore made with the<br>peasants on what is now known as the <i>Rayativari</i> system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Rayatwari,<br>237                         |
| A third system of settlement, the <i>Lambardari</i> , was made in many parts of the country, especially in the North-West Provinces and in the Pan jáb, where village communities, more or less united, were found to hold tracts of land. On the members of these communities jointly the settlement was made, and these communities, now recognised as having proprietary rights, can let the lands they do not wish to cultivate to tenants, but the communities, not the tenants, are responsible for the Government revenue. In the <i>Rayatwari</i> provinces village communities own only the fields they cultivate—the waste lands adjoining belong to Government and consequently the revenue may be increased by the cultivation of waste lands or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Lambardari.<br>233                        |

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| INDIGOFE<br>tinctoria                      | The margo Flant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| LAND<br>TENURE IN<br>iNDIGt)<br>DISTRICTS. | decreased by the non-cultivation of fields formerly cultivated. In <i>samin-</i><br><i>dari</i> provinces the village communities are created actual proprietors on a<br>fixed revenue for a tract of land whether cultivated or not, and this often<br>includes large expanses of waste lands which belong to the village.<br>The above sketch of some of the general features of land tenure has<br>been compiled from Mr. W. Q. Pedder's memorandum on the subject,<br>and it is hoped that it may convey some idea of the position of land<br>tenure as it affects indigo cultivation. It need only be necessary in fact to<br>give further a few passages from writers who specially deal with the ad-<br>vantages of the one and disadvantages of the other system, in their special                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| BENGAL.<br>239                             | <ul> <li>validages of the one and disadvantages of the other system, in their spectal bearings on indigo.</li> <li>Bengal.—Mr. A. P. MacDonnell, Magistrate of Durbhanga, in his Administration Report for the year 1876-77, gives a full account of the indigo cultivation in that district, one of the divisions of what is by planters spoken of as Tirhut. Mr. MacDonnell wrote of the systems of tenure and conditions of indigo cultivation.—" The cultivation of indigo is either <i>Zeraty * Assamiviar or 'Khooshgee,</i>. It is <i>Zerat when the land is</i> in the planter's sole possession, and the rayat employed on it is a mere hired labourer. It is <i>Assatnivar when</i> the land is in the rayat's possession, and when he is compelled (being usually the planter's tenant) to grow indigo on it at fixed rates per <i>bigha</i>. It is <i>Khooshgee</i> when the rayat, under no compulsion, grows the plant as a remunerative crop."</li> <li>The Commissioner of the Patna Division, in his Administration Report for 1872-73, wrote as follows :—</li> <li>In the northern districts of Tirhut, Champarun, and Sarun, the indigo is cultivated, as a rule, in villages let to the planter by the zamindars, and is either <i>Assamiwar on Nij</i>. Under the former system when the lease is completed the rayat sattend the factory and execute agreements to cultivate a specified portion of their uplands with indigo. The common proportion now agreed upon is two to three cottahs per bigha of upland or <i>bhit</i>, though in some tew factories the proportion demanded is larger, amounting to five or six cottahs, which it appears was the rate prevailing, at least in Champarun and Sarun, before the indigo difficulties in 1867. The agreement is generally for the same term as the lease. At the time of executing it an advance is given, which remains unpaid without interest till the end of the term, and during each year the price agreed on to be paid for the size of the bigha. The average rate in Tirhut, where the bigha is about 4.225 square yards, is from R8-8 to R9, inclusive of rent; and in Sa</li></ul> |  |
| I                                          | factory, after which time they are useless for growing indigo, though, as the indigo plant has a long tap-root and draws its nourishment prin-<br>I. 239                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |

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| The margo Flant of Commerce. (O. Wall.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | OFERA<br>toria                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| the hidgo right of connected (G. with.) finc cipally from the subsoil, they are improved for the growth of cereals and green crops, which subsist upon the upper layer, which has had the advantage of a long fallow and of being manured by the indigo leaves. In lieu of the lands thus given up, a similar area of other lands is taken from the rayats for the rest of the term of the agreement, and in some instances a clause is inserted that these exchanged lands shall be selected by the factory from the best of those in the rayat's holding. "Speaking generally, the crop may be said in these districts to be sown in February, and the cutting and manufacture to commence early in July. A second cutting of the <i>khunti</i> crop generally takes place in Septemerer and the land is clear in October, except in the very few instances, and these are mainly on the south of the Ganges, where poppy lands are taken for the growth of a crop of irrigated indigo. No other crop can be grown during the same year: as when the crop is a rich loam, with a good subsoil, neither too sandy nor too stiff, and old river deposits not liable to inundation give the best yield; but fine crops are also grown in inland villages, or uplands or <i>bhit</i> . " In the districts south of the Ganges the system is totally different from that above described. The cultivation is for the most part <i>nij</i> , and is carried on in lands leased by the factory from the zamindars or rayats. The whole expenses of cultivation are paid directly by the planter, who employs his own labourers and bullocks. The seed is sown at the beginning of the rains, and the plant remains in the ground during two years, in each of which it is cut. In strong lands a third year's crop is sometimes taken; but, generally speaking, the land is given up at the end of the second year (when it is said to be eagerly sought after for the growth of green crops) and engagements made for other rayats. The whole expenses for two sets of land, one of which is occupied by indigo, and | OFERA<br>toria<br>NURE IN<br>NURE IN<br>NURE IN<br>STRICTS.<br>ENGAL. |

eady to be **I I. 240** 

INDIGOFERA tinctoria.

LAND TENURE IN INDIGO

DISTRIČTS.

N.-W. P.

The Indigo Plant of Commerce.

cut" (Report by the Director of Land Records and Agriculture). Mr. Reid (Culture and Manufacture of Indigo) devotes a special chapter to the systems of land tenure in these provinces. He speaks of indigo as having "flourished under the liberal Government of the North-West Provinces." He states that his experience is connected with the district ot Gorakhpur, which he adds "I emphatically believe to be the direction in which the industry of the blue dye, forced out of Behar^ will, in the near future, compulsorily seek its legitimate development. ΑĤ disputes, of whatever nature, between landlord and tenant, have to be adjusted before the Collector or Assistant Collector, with appeal, if desired, to the Commissioner, or finally to the Board of Revenue. Mr. Reia reviews briefly the conditions on which land may be held in these provinces, but the reader may consult on this subject for fuller details  $I^{ne}$ Rent Law Manual published by Mr. L. W. Teyen. By the provisions 01 the Rent Act (XII. of 1881) the term \* tenant" includes, in addition to the cultivators who inhabit the villages and cultivate the lands pertaining thereto, the sub-lessees and also the sub-sub-lessees. This tenancy, as, Mr. Reid puts it, divides itself into four great sections, (a)  ${}^{0CCU}Pf^{n}/5[$ tenants; (b) non-occupancy tenants; (c) tenants at fixed rates; and (a)ex-proprietary tenants. The Lambardari (from "lambar" a corruption of the English word "number" and dar holding) system, it is contended, gives to the North-West Provinces, a great advantage over Bengal, since every field, plot of grass land, cattle track, and village site has been surveyed and numbered. A tenant by reference to the patwari (or village accountant) can obtain an absolute statement of the fields and iF\*\*\* lands over which his tenancy right extends. On this point Mr. ReidI ad as, "The numbering of each field secures the tenant against the snut of about or exchange of lands and the confusion consequent upon tnis which obtains, with such miserable results, in Bengal. An  $occup \&^{nc} /$ tenant is one who has held unbroken possession of the same is in a s under cultivation for twelve years, or who inherited the same by |egat right. But a gift of land by the landholder confers no occupancy right, nor is an occupancy right transferable. But actual occupation of the land for a time as proprietor, and afterwads continuously as tenant for twelve years, established the rights of an occupancy tenure. Non-occupancy tenants are tenants who have not cultivated the land for a term of twelve years. These can be deprived of their tenures at the will of the landowner, on being served by a written notice of ejectment under the provisions of the Act. Tenants at fixed rates: This class of holdings only; occurs in the permanently-settled districts, and the term 'fixed rates implies the grant of land on terms agreed upon at the settlement. This right is inheritable as well as transferable, and the rate cannot be enhanced except on the ground of increased value of holding by alluvial deposits or otherwise. Ex-proprietary tenants are those who have lost or parted with their proprietary rights, but who retain an occupancy tenant right on the land, holding the same at a rental of 4 annas in the rupee less than the prevailing rate payable by *tenants\*at-\*aill''* 

The above sketch, which more immediately concerns the North-West Provinces, with slight modifications, is applicable to a great part of India—the regions where a *rayatwari*, or a village settlement, prevails.

the regions where a *rayatwari*, or a village settlement, prevails. *Madras.*—The *Madras Mail*, in an article on indigo cultivation, reviews briefly the difference between the tenure of land in the Southern Presidency and that in Bengal. "In Bengal," the *Mail* remarks, "everything is under the so-called *zamindari* system. The whole country has been parcelled out into blocks, and leased, for sums far below their actual value, to zamindars. These persons do not farm their estates but sub-let them I. 241

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## **Products of India\***

tinctoria. in blocks or in detail to renters. Under a system of this kind it is of course easy for the European to acquire an estate and grow on it indigo, opium, or what he likes; the proprietor will lease to the man who gives him DIŜŤŔĨČŤS. the best rent and is the most punctual paymaster. Under the rayatwari MADRAS. system as it prevails in Madras, this is impossible. Here we have scarcely any zamindars. The great bulk of the land belongs to the Government and is let direct to the rayats, who are petty farmers holding on an average about io'acres each. To these acres they cling with the utmost tenacity, so that there is no opportunity for the European to step in and inaugurate an enterprise of his own. It is here that the reason why the zamindari system is often called 'the curse of Bengal' is to be found. Though the country is prosperous, the people derive but little benefit therefrom. This goes to the zamindars and their sub-renters for whom the people have to work. In Madras, the rayat is independent: he works for himself and takes all the profits to be derived from his land. This, it is true, is only small in extent, and he pays a higher rent per acre than the Bengali zamindar, but the whole of the proceeds derived from the land is divided between himself and his fellow-rayats, and there are far fewer middlemen to be enriched at his expense." The Collector of Cuddapah, in his report for this work, says: "There is nothing special about the tenure of land cultivated with indigo; the landowner and cultivator divide the crop in equal shares." The Collector of Kurntil says there is no separate assessment for indigo lands: the tenure for indigo cultivation is not distinguished from that for any other crop. The Collector of Vizagapatam says : "We have no particular land tenure here for indigo, as the crop is raised by rayats in common with other crops. The rayatwari system is that observed in the Government taluks of this district." But although the Madras system would seem to throw a larger share of the profits into the hands of the actual cultivators than is the case in Bengal, still the same evils from the system of advances would seem, to some extent at least, to prevail in Madras. In the Settlement Report of the Cuddapah district it is, for example, stated that \*' The poorer rayats will not sow indigo unless they are forced to do so by their creditorsthe rich Reddies and Banians,—who always manage to cheat the rayat of a large amount of the profits which is placed to the credit of interest due on loans."

## MANUFACTURE OF INDIGO.

The process of preparing Indigo from the plant differs but little in the various provinces of India (at least in the hands of European planters and with larger Native concerns), so that a general description may suffice. Departures from the type will be found discussed in the Chapters on \*' The INDIGO OF COMMERCE " and " The CHEMISTRY OF INDIGO."

Briefly, it may be said, the necessities of Indigo manufacture are—a manager who is methodical, shrewd, ubiquitous, with a business turn of mind fitting him alike for office routine and the securing of contracts; a liberal supply of good water; an influence, direct or indirect, over the neighbouring cultivators, sufficient to guarantee a regular supply of green plant; a factory, commonly called "The Concern," comprising certain vats, machinery, and appliances; and a staff of loyal employe's who can be educated to carry out their various duties tidily and promptly. Space cannot be afforded in the present article to treat in detail of every necessity of indigo manufacture. The respective duties of the manager and of his army of employe's must be left untold. A supply of good water and a regular production of indigo plant are necessities without which the Concern cannot exist. In the chapter on CULTIVATION and in that on LAND TENURE,

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MANUFAC-TURE.

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| NDIGOFER<br>tinctoria. | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| MANUFAC-<br>TURE.      | the production of plant has been fully dealt with, as well as the difficultie<br>which exist in securing a uniform supply. It remains, therefore, to nar<br>rate, as briefly as may be possible, the construction of an Indigo Concern<br>and the manipulation in the various stages of Manufacture.<br>It may be remarked that there are primarily two processes according<br>as WET ( $e^*g_{,9}$ fresh or green) plant or DRY leaf are employed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| WET PRO-<br>CESS.      | I.—WET PLANT PROCESS. "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Water. 243             | Supply of water.—Proximity to a river or other unfailing source of<br>water is indispensable. In order that the water may be brought on a level<br>with the highest vat in the concern, pumps may be required. The water<br>should be raised to a reservoir, sufficient to contain about 10,000 cubic feet<br>It should be there retained for some hours, so as to allow the sediment to<br>deposit, before being used. Muddy water would of course impregnate the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Vats.                  | dye with a quantity of dirt from which it could with difficulty only be again<br>freed. Stagnant and foul water is found to impart to the infusion (the<br>fecula or <i>mal</i> as it is called) a property which it is extremely difficult to<br>conquer—namely, of retarding the process of settling and drying.<br><i>The</i> Kafr.—Pipes are required to connect the supply of water with the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 244                    | Steeping-vats, the Beating-vats, the Pulp-boilers, and the Engines. The size of the reservoir as well as the number of vats is dependent on the amount of plant which has to be annually treated. We may assume a concern of twelve Steeping-vats. These are built of brick and portland-cement, and are in dimensions $24x18x5$ feet. These should be arranged in a row and have in front and below the floor level, a corresponding series of shallower and wider vats (3 to 4 feet deep) known as the Beating-vats. The Steeping-vat communicates with its Beating-vat by a hole at the bottom into which a large wooden plug is driven from the outside. By removing this plug the infusion prepared in the Steeping-vat is drained into the Beating-vat. In a similar way the Beating-vat has a number of holes with plugs arranged in a vertical series, which open into a drain. When the fecula has been precipitated to the bottom of the Beating-vat these plugs are successively removed so as to draw off the useless surface fluid which 13 allowed to run to waste, or is used as a manure for the fields. The sides of the Beating-vat are made to curve inwards at the top so that the liquid when set in motion may not splash over. When the surface fluid has been carefully drawn off, the thickish deposit is raised by buckets and thrown on a strainer. This removes large mechanical impurities. It then flows by a pipe to a cistern under the boiler pump, sometimes called the Pulp-vat, which has the dimensions of $15 \times 10 \times 3$ feet. Before leaving the pipe it passes through a second strainer in the form of a cloth or bag tied over the end. The mouth of the suction pipe of the pump which dips to |
| Boiler.<br>2+5         | the bottom of the cistern is closed by a sieve or rose which also assists in<br>the process of straining. The infusion is then raised by the pump and<br>discharged through a further cloth strainer into the boiler.<br><i>The Boiler</i> should be of thin copper in preference to iron and placed<br>in a room instead of in the open air as are the vats. If madfc of copper<br>the boiler heats more rapidly and uniformly, and the indigo is less liable<br>to get burned: it also lasts longer and is therefore more economical, though<br>the initial cost is greater. The boiler for a factory of the size described<br>should be 25 feet long by 12 feet wide and 4 feet deep; and this will* if<br>required, produce 5 maunds (374ft) of dye. As soon as the fecula has<br>been discharged into the boiler (or after the removal of any surface liquid<br>$112^{may}$ chave $f_{2TM}^{164}$ ) acertain quantity of clean water is poured into the<br>boiling point. For this purpose steam may be employed in addition to a<br><b>L</b> . ${}^{2}45$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                                                                                                                                                                                        | DIGOFERA<br>tinctoria. |
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| furnace. All the while the pulp is carefully stirred and kept gently boil-<br>ing for three hours. A fragrant smell and the formation of bubbles on the                                                                                | MANUFAC-<br>TURE.      |
| surface indicate the completion of the boiling process.<br><i>The Table or Dripping-wat.</i> —The boiling fecula is now discharged on                                                                                                  | WET PRO-<br>CESS.      |
| to a table over which a large damp cloth has been spread. The water<br>percolating through the cloth is pumped up from the surrounding<br>drain and poured over the mass until it passes away in a dark red tint                       | Table.<br><b>246</b>   |
| without fcing charged with indigo. In five or six hours on a wide-spread table (or shallow wooden vat) $(40 \times 10 \times 2$ feet), the major portion of the                                                                        |                        |
| water will have drained away, and the fecula settled on the surface of the cloth. If the straining and re-straining does not readily result in the pro-                                                                                |                        |
| duction of a clear fluid, alum water may be poured over the pulp, but this is rarely necessary. The pulp should now be scraped together in a corner,                                                                                   |                        |
| the ck9th folded over, and a weight placed on the top. In this condition it should be left in a few hours to cool and drain still further.                                                                                             |                        |
| The Press.—This consists of a square wooden box well-fitted and covered with a damp cloth or sheet inside—the framework having on ail                                                                                                  | Press.<br><b>247</b>   |
| sides numerous perforations. The inside measurement is 42 inches long, 24^ inches broad, and 12 inches deep, and it is open at top and bottom.                                                                                         |                        |
| This framework or mould is placed on a strong table, and is provided with<br>loose boards for the top and bottom which exactly fit the interior of<br>the mould. It is arranged under a powerful screw which can be turned             |                        |
| with long levers. The fecula from the table is placed within the box, the<br>cloth is folded over the top, and the lid adjusted over all when the screw-                                                                               |                        |
| press is brought into bearing. One turn of the screw is given every now<br>and then for about five hours until the mass of indigo in the press, at first                                                                               |                        |
| about 8J inches deep, is compressed to 3 or 3J inches, or until no more water is seen to be oozing from it. The pressure is then removed evenly and gently, the sides of the press lifted off and the sake $(42 \times 244 \times 34)$ |                        |
| and gently, the sides of the press lifted off and the cake (42 X 24 <sup>x</sup> x 3 <sup>§</sup><br>nch) exposed.<br><i>Cutting the Cake.</i> —It is now marked off into 3 or 3! inch square blocks,                                  | Cakes.                 |
| each of which receives the brand of the Factory and the number assign-<br>ed to the day's manufacture. The cutting up into cakes is accomplished                                                                                       | 248                    |
| very often by carrying the slab resting on the bottom loose lid of the press<br>o another room and depositing it in a frame of the same dimensions which                                                                               | i                      |
| has slits on its sides; thus allowing of the cake being cut lengthwise and preadthwise, so that by 12 cuts in the former direction and 7 in the latter,                                                                                |                        |
| t is broken up into 84 cubical cakes, each 3J inches in size. The cutting<br>s generally accomplished by means of a brass wire stretched between two<br>vooden handles; but a knife may also be employed. The cubes or cakes           |                        |
| re now ready for removal to the drying house.<br>Drying or Cake House.—This should be a room well ventilated, with                                                                                                                     | Drving House           |
| neans of preventing severe draughts and blasts of dry wind. It should be bout 100 feet long by 50 feet wide and 20 feet high, and be fitted with                                                                                       | 249                    |
| helves of a light bamboo framework, sufficiently far apart to allow boys<br>o crawl along the shelves. The cakes are carried from the cutter's                                                                                         |                        |
| nands to the drying room and arranged on the shelves, each cake being<br>urned over from side to side until quite dry.<br><i>The Sweating Room.</i> —The cakes are now conveyed to a closed room                                       | Sweating               |
| n which they are arranged in small walls, each day's manufacture being istinctly marked off from the other. The walls of cakes are next covered                                                                                        | Room.                  |
| ver with blankets and dry bran, and the doors of the room secured,<br>o that as little air as possible may be admitted. In about fifteen days                                                                                          |                        |
| ime the sweating process will be completed when air should be let in<br>ery slowly and the walls of cakes uncovered by degrees, the uncover-                                                                                           |                        |
| ng process taking four or five days. A sudden exposure would very                                                                                                                                                                      |                        |

| <u></u>                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDIGOFER                                                              | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| THEORY OF<br>MANUFAC-<br>TURE.<br>WET PRO-<br>CESS.<br>Packing.<br>251 | probably crack the cakes. This process of sweating improves the brilli-<br>ancy and imparts the much appreciated white skin.<br><i>Packing.—The</i> cakes being thus thoroughly dried (a process which<br>lasts for about three months), they are each brushed and packed into<br>specially prepared boxes of well-seasoned wood, each box or ° Case<br>being filled, if possible, with the cakes bearing the same mark denoting the<br>day of manufacture. The actual number of cakes in the box should be<br>registered, and if it be necessary to mix the different days' manufacture,<br>the number of cakes placed in it bearing, for example, No 5 and those<br>bearing No 25 &c &c should be carefully recorded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Steeping.<br>252                                                       | bearing No. 25, &c, &c, should be carefully recorded<br>Action of Steeping.—So far we have followed the fluid from the steeping-vat till it is ready for the market, and in doing so we have briefly<br>alluded to the main features of the indigo factory. It is necessary to<br>return to the steeping-vat and discuss the process by which tile $^{\Lambda}CJV^{a}$<br>is extracted and manipulated. The manager, having seen that all the<br>necessary repairs have been made on the factory, that the vats are $^{Clean}$ ,<br>the reservoir full of clear water, the pumps and machinery in good $^{NoT}$ ,<br>ing order, the carts and oxen, or boats, in good condition, and the culti-<br>vators ready to cut the crop, fixes a day for the commencement 01<br>operations. The plant is ready, on the flowers having begun to $j^{err1}$ ,<br>The stems are cut within a few inches of the ground, baled into " bundles,<br>and carted off to the factory as soon as possible. The plant is measured<br>or weighed, and stacked in the shade until the afternoon, when the R <sup>ogy</sup> "<br>ing of the steeping-vat commences and must be completed before " $j^{err}$ .<br>fall. Much difference of opinion prevails as to the best method of pacK-<br>ing the steeping-vats. The most general way is to arrange the bundles<br>in two layers, one standing on the floor on their stump ends, the o <sup>ther</sup> T <sup>err</sup> ,<br>form depth. Most planters hold, however, that the method of pac King<br>is immaterial, so long as two conditions are observed: (a) facility for in<br>fluid to drain readily and completely through the tap; (b) uniformity hori-<br>zontally, bo that when the beams used for fixing the plant are $^{Prouf}t^{ers}$ .<br>From the plant is firmly fixed and compressed. When this has been<br>done water is allowed to flow into the vat until the plants are nearly<br>covered. "The night being moderately fair, and the plant good and mode<br>the vat the plant. By means of beams and levers acting on the side of<br>the vat the plant. By means of beams and levers acting on the side of<br>the vat the plant. By means of beams and levers acting the thas |
|                                                                        | I. 252                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| The Indigo Plant of Commerce. (G. Watt.)                                                                                                                                                                                                                                                                          | DIGOFERA                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| ti                                                                                                                                                                                                                                                                                                                | <u>nctoria.</u>                            |
| plant is not only macerated in water but fermentation of a vigorous nature<br>is set up in the steeping-vat, for the fluid rises up from 6 inches to one<br>foot, an expansion that has to be provided for by not completely filling the<br>vat. In the morning the temperature of the water is found to stand at | THEORY OP<br>MANUFAC-<br>TURE.<br>WET PRO- |
| $95^{0}$ to $90^{0}$ Eabr. After the fluid is run off into the besting yet the plants                                                                                                                                                                                                                             | CESS.                                      |
| are green but have lost about 12 per cent, of their weight. The indigo                                                                                                                                                                                                                                            | Fermentation in the Steep-                 |
| refuse (seet) is removed to a short distance and dried and stacked. It is                                                                                                                                                                                                                                         | ing-vat. •                                 |
| of great yalue as a manure to the fields, and is also invaluable to the planter as fuel for his next year's operations.                                                                                                                                                                                           | 253<br>Seet as                             |
| Beating and its Effects.—The fluid having been run from the Steep-                                                                                                                                                                                                                                                | a manure.                                  |
| ing, to the Beating-vat, various contrivances are adopted for beating                                                                                                                                                                                                                                             | 254                                        |
| it, in all of which a two-fold object seems to be attained : (a) the liquid                                                                                                                                                                                                                                       |                                            |
| is subjected to the action of the oxygen of the air; $(b)$ the particles of the d'>e-stuff are consolidated or aggregated into sufficiently large par-                                                                                                                                                            |                                            |
| ticles to facilitate their rapid precipitation. That the fluid obtained from                                                                                                                                                                                                                                      |                                            |
| the steeping-vat is not blue-indigo seems very generally accepted, and                                                                                                                                                                                                                                            | Orridation in                              |
| it is accordingly said that the beating oxidises it, hence several chemical                                                                                                                                                                                                                                       | Oxidation in Beating-vat.                  |
| processes have been patented for directly oxidising the fluid and thus<br>lessening or dispensing with the necessity for beating. The fact that oxi-                                                                                                                                                              | 255                                        |
| dising agents do actually facilitate the precipitation of the blue dye-stuff                                                                                                                                                                                                                                      |                                            |
| seems to prove that combination with oxygen is necessary before the                                                                                                                                                                                                                                               |                                            |
| greenish fluid of the Steeping-vat can be converted into the blue fecula of<br>the Beating-vat. It would, therefore, appear that the steeping and ferment-                                                                                                                                                        |                                            |
| ation ultimately result in the formation of the substance known as white-in-                                                                                                                                                                                                                                      | White-Indigo<br>produced by                |
| digo—a compound that contains one atom more hydrogen than blue-indigo.                                                                                                                                                                                                                                            | Fermenta-                                  |
| An atom of oxygen combining with two atoms of hydrogen (derived from<br>two propertienc) would form water and themely reduce or reconvert the                                                                                                                                                                     | tion. <b>256</b>                           |
| two proportions) would form water and thereby reduce or reconvert the<br>white soluble indigo into the blue insoluble compound which is the essential                                                                                                                                                             | 200                                        |
| property of the indigo of commerce. It has to be admitted, however, that                                                                                                                                                                                                                                          |                                            |
| no chemist has actually subjected the materials of the indigo factory to                                                                                                                                                                                                                                          |                                            |
| analytical test, and that the above explanation is based, therefore, on the results obtained under similar circumstances with other plants than Indi-                                                                                                                                                             |                                            |
| gofera tinctoria. If the fluid obtained from the steeping-vat contains,                                                                                                                                                                                                                                           |                                            |
| before beating, the substance known as white-indigo, a piece of cloth                                                                                                                                                                                                                                             |                                            |
| dipped in it and then exposed to the air should rapidly show that it has                                                                                                                                                                                                                                          |                                            |
| been dyed with indigo. In a further chapter, the chemistry of indigo and<br>the explanation of the dyers'-vat, will be discussed; but in concluding this                                                                                                                                                          |                                            |
| brief allusion to the formation of the blue fecula, it may be said that if                                                                                                                                                                                                                                        |                                            |
| the fluid of the steeping-vat does not contain white-indigo, but only finely                                                                                                                                                                                                                                      |                                            |
| divided blue-indigo, the beating can exercise no oxidising influence what-<br>soever, and the patent processes that liberate oxygen within the fluid                                                                                                                                                              |                                            |
| must in that case have, like the cruder methods of beating, only a mecha-                                                                                                                                                                                                                                         |                                            |
| nical, not a chemical, action.                                                                                                                                                                                                                                                                                    |                                            |
| The simplest form of a Beating-vat is that used by the primitive dye                                                                                                                                                                                                                                              | Primitive                                  |
| manufacturers. The plants having been steeped in a large earthen pot<br>are removed, and by means of a date-palm leaf or other such substance                                                                                                                                                                     | Beating-vat.                               |
| the fluid : 3 lashed about until the change takes place from a green to a                                                                                                                                                                                                                                         | 257                                        |

manufacturers. The plants having been steeped in a large earthen pot are removed, and by means of a date-palm leaf or other such substance the fluid : 3 lashed about until the change takes place from a green to a blue precipitate. About this time a certain quantity of lime water is added which is supposed to facilitate the precipitation. The contents are set aside to allow of slow evaporation of the water, and when quite thick and almost dry a lump of lime is generally used to close the mouth of the jar until such time as the dye-stuff is to be utilised. This in principle is the process formerly pursued by all European planters, and by most of the smaller factories even at the present day. The fluid having been drawn from the steeping- into the beating- vat, from 10 to 12 men are sent into the fluid (which is sufficiently deep to rise to about their waists) and, standing in

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Use of Lime. 258

Beating- bymanual labour.

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| INDIGOFER                                              | A The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <u></u>                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                        | two rows facing each other, they commence to lash the fluid with wooden<br>oars or staves, or simply by means of their hands. At first slowly and<br>regularly, but as the froth forms and then begins to disappear, the rapidity<br>of beating increases until the liquid is often made to rise in a great wave<br>between the beaters. The higher the fluid is raised into the air the better,<br>so long as irregular beating does not cause it to lash over the sides of the<br>vat and be thus lost. At no time, however, should the beating be violent<br>or spasmodic, but the beaters may slowly move to right and left, thus<br>giving a greater impetus to the movements of the fluid. Violent beating<br>is thought to break the grain of the forming dye too much, and the steadily<br>increased motion is held to prevent coarse grain forming. The exact<br>period of beating cannot be arbitrarily fixed, as it depends on the degree<br>of fermentation that took place in the steeping-vat, and the temperature and<br>the humidity of the atmosphere. In about two to two-and-a-hai/ hours<br>the froth will have disappeared, the vat will have passed from bright to<br>dark green, then purple and ultimately to dark blue. Before the order is<br>given to discontinue the beating, a small quantity of the fluid is taken up<br>by the dipper from near the bottom forming a sharp edge between the<br>sediment and the fluid, the beating may be considered as satisfactorily<br>accomplished. At this stage it was the habit (and in some factories is so<br>still) to throw into the vat a quantity of lime-water (about 6 <i>calsis</i> = i <sup>o10</sup> ,<br>12 gallons). Instead of using lime-water to complete the precipitation or<br>the dye as it is called, a more favourite and modern process consists <sup>14</sup><br>allowing a quantity of pure cold water to be discharged on the surface of<br>the beating-vat from pipes arranged on the walls around thecircumference.<br>This ready supply of water is also of advantage in washing out the vate<br>the beating-vat from pipes arranged on the walls around thecircumference.<br>The explanation may be here offered that the effect of |
| Danger of<br>Heat.<br>261                              | glucoside obtained from the plant remain undecomposed, this would P. <sup>rov</sup> f<br>highly injurious in the boiler, since by heat, it is known to give origin to<br>browns, reds, &c, that depreciate the value of the dye. The beaters are<br>now told to walk round the vat about a dozen times so as to give a rotatory<br>motion to the contents, afterwards to rapidly jump out. In two or three<br>hours after beating according to the state of the weather, the indigo w''l<br>have settled to the bottom and the surface fluid may be slowly drained off.<br>It seems to be universally admitted that the beating oxidises the infu-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Chemleal ex-<br>planation of<br>Beating*<br><b>262</b> | sion. If the oxygen combines with the indigo instead of with other organic materials, we must assume that the indigo (or a certain proportion of it) exists in the condition of white-indigo. The chemistry of the sumstance clearly shows that no other indigo compound can be made to $ bine with oxygen. It was formerly held that carbon was • removed by oxidation from the compound that was thus reduced to indigo. This view seems opposed to the chemistry of the substance, and carbon, w liberated, is not derived from the soluble glucoside (obtained by the maceration of the indigo plant), the compound which, by decomposition, forms indigo. Many writers still hold, however, that carbonic acid is liberated ; and, if so, it must be viewed as a secondary product of the$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Liberation 01<br>Carbonic                              | fermentation, but one not derived from the substance which ultimately<br>affords indigo. The liberation of carbonic acid, it is held, is the cause of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| a <b>263</b>                                           | froth observed both in the steeping- and the beating- vats. The use of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                        | L 263                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| lime, at the close of the beating process, is regarded as destroying the fermentation, which, if still existing in the fecula, would cause destructive changes during the period of subsequent manufacture. The boiling which follows is viewed as liberating volatile materials, expelling air, oxygen, and carbonic acid while at the same time coagulating the albumen and concentrating the pulp. The writer, while endeavouring to criticise the various opinions that are held regarding the reactions and decompositions that take place in the manufacture of indigo, must not be viewed as advancing any peculiar theory of his own. The literature of the subject establishes two entirely antagonistic ideas, the one followed by the actual manufacturer and the other inculcated by the chemist. In the absence of the results of a chemical examination of the process, it has seemed to the writer that the best course for him would be to exhibit the arguments in favour of, and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | THEORY OF<br>MANUFAC-<br>TURE.<br>WET<br>PROCESS.<br>Effects of<br>boiling the<br>Fecula.<br>264.<br>Antagonistic<br>Ideas.       |
| defects in, the practical and the chemical methods of indigo manufacture.<br>Instead of using men to beat the liquid of the oxidising-vat (as it is<br>sometimes called) various patent machines may be employed. For this<br>purpose, for example, the ends of the vat are founded, and on the bottom<br>along the centre lengthwise is formed an interrupted ridge upon which is<br>adjusted two paddle wheels. These are made to revolve by steam power<br>and a free circulation of the liquid is thus set up, the rapidity of which<br>may be controlled with the utmost nicety. By another process air is forced<br>through the fluid, or by still another method it is conveyed to the particles<br>of white-indigo by centrifugal force. To discuss all the patents that<br>exist would take greater space, however, than the writer has at his dis-<br>posal. So also, for example, various patents have been granted for chemi-<br>cal inventions in which the liquid both in the steeping-and beating-vats is<br>brought under the influence of direct oxidising agents. Certain proper-<br>ties have been claimed (and planters have been found to substantiate<br>these claims) for patents in which ammonia, alum, nitre, caustic soda,<br>essential oils, &c, are added to the steeping- or beating- vats. If ferment-<br>ation be a practical necessity of the isolation of indigo from the plant, such<br>patents are probably fully justified, but the chemist holds that fermentation<br>is not a necessity, that simple maceration in cold or hot water slightly<br>acidulated extracts from the plant a soluble glucoside which, by the action<br>of water alone or still more readily in the presence of acids, splits into<br>indigo-blue and a form of sugar. For this decomposition neither oxygen | PATENTS.<br>265<br>Machinery<br>used in Beat-<br>ing.<br>266<br>Chemical<br>methods.<br>Fermentatio<br>not neces*<br>sary.<br>267 |
| nor alkalies are necessary; indeed, the latter are highly injurious, as they cause, at certain temperatures, a decomposition of the glucoside from which indigo-blue cannot again be prepared.<br>In concluding this brief review of the various stages of manufacture and of the probable reactions which take place, it may be remarked that Mr. Richard Olpherts has patented several mechanical improvements that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                   |

Richard Olpherts has patented several mechanical improvements that seem of much value. He proposes that the dye-yielding parts of the plant only—the leaves—should be introduced into the Steeping-vat. For this purpose he has large iron-wire cages constructed so as to fit carts and so many of them to accurately fill the vat. These are taken to the fields, charged with leaves as tightly packed as possible, and conveyed to the factory. They can then he lowered into or resided from the vat with the factory. They can then be lowered into or raised from the vat with great ease, while the leaves are held at a given depth in the water until the desired infusion has been obtained. Each cage may then be raised and placed on a platform over the vat, where it may be washed out by having the leaves trodden on, while clean water is being poured over. The patentee claims several advantages which are, as it would appear, borne out by a chemical study of the substances obtained. A lesser

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| INDIGOFE                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| tinctoria.                    | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MANUFAC-<br>TURE.<br>PATENTS. | volume of water relative to the bulk of dye-yielding material is necessi-<br>tated, which has its advantages chemically and mechanically, while fer-<br>mentation is irore under control. From the writer's theoretical convictions<br>he would add that the lessened fermentation is probably an immense<br>gain, but the process might be still further perfected by slight improve-<br>ments having in view the prevention of fermentation entirely. On the cages<br>of leaves being removed, the beaters are sent into the steeping-vat, and<br>after a degree of beating, the surface fluid is drained into 'he ordinary<br>beating-vat. It is there subjected to a further beating, whereby a propor-<br>tion of indigo is recovered which, Mr. Olpherts affirms, is, by the ordinary<br>process, allowed to run to waste. The sediment from both the upper ana<br>lower vats is next carried to the pulping-vat, and for most of its stages of<br>subsequent treatment, Mr. Olpherts appears to hold patents for methods<br>of his own. The advantages of Mr. Olpherts' system have been com-<br>mended by Professor Ohurch, who appears to have examined ing<br>improvements. It cannot but be regretted, however, that a chemist of<br>eminence has not reperformed the analysis of indigo with special reference<br>to the various processes in use for its manufacture, since it has to <i>oe</i><br>admitted that the industry is still in an experimental condition, instead 01<br>having matured into one, in which, like soap and candle-making, every<br>stage is dependent on some ascertained chemical fact. **<br>Using boric acid in the steeping-vat. They account for the advantages they<br>claim by affirming that two classes of organisms are always present in the<br>water of the steeper and that these set up two kinds of fermentation. ***<br>and the other probably without the production of any indigo-white what-<br>ever. They also profess to have discovered that boric acid acts as a<br>selective antiseptic preventing the latter injurious fermentation. ***<br>and the other probably without the production of any indigo-white what-<br>ever. They also profess to have |
| PROCESS.<br>268               | good as the boric acid.<br>II.—THE DRY LEAF PROCESS.<br>Instead of rapidly conveying the bundles of freshly-cut plant to the<br>factory, as pursued in Bengal, in Madras it was formerly very 2 <sup>TM</sup> **''?'<br>and to some extent it is still, the habit to dry the leaves before<br>irfaceration. An inferior quality of dye is said to be produced by this<br>system, but it has the advantage of being suited to the necessities of<br>small growers who are themselves manufacturers. Factolies of a PH"?''<br>tive kind are built by speculators, who hire these out to the growers. * ne<br>dry leaf may have in consequence to be carried to a distance, or only one<br>factory existing in a district, each grower may have to wait his turn of being<br>able to enc-Act <sup>er</sup> . In a district, each grower may have to wait his turn of being<br>able to enc-Act <sup>er</sup> . In a district, each grower may have to wait his turn of being<br>able to enc-Act <sup>er</sup> . In a district, each grower may have to wait his turn of being<br>able to enc-Act <sup>er</sup> . In a district, each grower may have to wait his turn<br>dry-leaf process it can be manufactured at the convenience of the owner.<br>In the official report furnished for this work by the Madras Govern-<br>ment, the following rides relation is given of the lary leaf system : " If he<br>full ts throcess is carried out in th<br>same way as the green-leaf, except<br>that the plant is cut, dried, and threshed to collect the leaves separately,<br>I. 268                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                                                                                                                                                                                                                                                                                             | IGOFERA<br>nctoria                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| kept dry, the leaves undergo, in the course of four weeks, a material                                                                                                                                                                                                                                                       | MANUFAC-<br>TURE.<br>DRY PRO-<br>CESS. |
| with six times their bulk of water, and allowed to steep for two hours, with continual stirring, till all the floating leaves sink. The fine green liquor is then drawn off into the Beating-vat. In this method the fermentation of                                                                                        | C100.                                  |
| the fresh leaves, often capricious in its course, is superseded by a much<br>shorter period of simple maceration." The Collector of South Arcot<br>writes : "I may say that the dry-leaf process is more largely resorted to<br>in this district than the fresh-leaf process of manufacture, seeing that the                |                                        |
| cultivation is carried on chiefly in the dry season, when very little moisture<br>is retained in the leaves; should, however, there be rain at the time of<br>cutting, the fresh-leaf process necessarily takes place." Most of the                                                                                         |                                        |
| wet process. It thus seems probable, that as in Mr. Olpherts' process<br>described above, a much less amount of fermentation is involved than in<br>Bengal; indeed, when the leaves are boiled and a decoction prepared, in the                                                                                             | o Fermenta-<br>tion.<br><b>269</b>     |
| ladigo of commerce), the Collector, Mr. E. J. Sewell, speaks of the fresh<br>leaves as employed, but makes no mention of fermentation being set up                                                                                                                                                                          | Kurpa Indigo.<br>270                   |
| in the steeping-yat. The fluid is, however, subsequently beaten for three or four hours, the liquor changing from green to deep blue with the grains of indigo settling to the bottom. 'He then makes an interesting remark that may have a wide significance. "The juice of ' <i>Neradit</i> * bark, and some-             |                                        |
| times a little gingelTy oil is added in the steeping-vat when bubbles begin<br>to rise." "The adulteration with blue mud, which has become so common,<br>is done in the boiling process." The <i>Neradu</i> is perhaps the bark of<br>Eugenia Jambolana, the bark which Mr. C. Kough says is used in Kur-                   |                                        |
| ntil for the same purpose. That gentleman adds that—"In some parts,<br>before heating the water containing the decomposed <i>indican</i> , sweet-oil is<br>mixed in order that the <i>indican</i> may sooner be separated. A small<br>quantity of decoction of <i>Netadi</i> bark (Eugenia Jambolana), or of <i>Tugarsa</i> |                                        |
| seed (Čassia) and lime-water are mixed to improve the quality of the indigo." The writer in another part of this work (see Cassia Tora, <i>Vol. II.</i> , <i>p. 225</i> ) has already dealt with the somewhat puzzling use of the seeds of                                                                                  |                                        |
| Cassia Tora along with indigo. The knowledge of this property is so wide-<br>spread as to demand more careful consideration than has hitherto been<br>paid to it. It is mentioned by authors writing of the Panjab, of Bombay,<br>of Madras, of Bengal, and of China. Mr. Wardle found these seeds to                       |                                        |
| contain by themselves a useful yellow colour, and it may be assumed<br>that they have something to say, from this property, to the formation (along<br>with the indigo of a species of Rhamnus) of at least one of the forms of<br>Chinese green-indigo. But that they are regularly collected and sold to                  |                                        |
| the indigo manufacturers of Madras, and not for any purpose of making green-indigo, is a fact, and a fact that has to be accounted for. They seem to be of special use in the preparation of <i>Pala</i> indigo, a dye prepared from                                                                                        | Oil used.                              |
| the leaves of Wrightia tinctoria, though, as Mr. Kough informs us, they<br>are also used in the boiling stage in the manufacture of the indigo of<br>commerce. What action oil can serve is difficult to see, but Mr. Akitt<br>has patented the use of <i>essential oils</i> which he claims, serve as vehicles to          | 271                                    |
| convey oxygen to the white-indigo. But demonstrated science, it may be<br>remarked, has done so little for indigo that the dye manufacturers of<br>Madras must be credited with practical and useful discoveries.                                                                                                           | SHORTT'S<br>PROCESS.                   |
| Dr. Shortt, in his prize essay on Indigo, describes a process of manu-                                                                                                                                                                                                                                                      | 272                                    |

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Dr. Shortt, in his prize essay on Indigo, describes a process of manu-

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# **INDIGOFE**RA The Indigo Plant of Commerce. tinctoria factureofmuch interest; but it is somewhat difficult to discover! whether MANUFAC-TURE. that process is only recommended by him as an improvement, or actually pursued by some of the European manufacturers of Madras. The fresh plant on arrival at the factory is at once placed in large W<sup>er</sup>J J $^{r}$ fl in a steeping-vat. "The boiling should be continued," says Shortt, **boile**f the leaf yields its colouring matter to the water; in the mf\*''\*''<sup>1</sup>\* ®?f should should have an attendant with a large proper with which the A-lant. SHORTT'S PROCESS. Preparing by Boiling the Sleeping-vat. should have an attendant with a large prong with which the plants is be constantly kept under water, and who should be careful to, see $T_{M}$ 273 heat of the fire is reduced the moment ebullition occurs, for if the $DQ''^R$ is carried on longer than necessary, the colouring matterwii ra stroyed. This requires a great amount of practical knowledge, ^a f1 rule can belaid down which alone will be sufficient for the guidance. o ^ inexperienced. By opening the cocks occasionally, and obser $\frac{1}{2}$ , $5^{-1}_{d}$ colour of the decoction (which should be somewhat oily in appearance, ^ have a reddish colour with a peculiar musty $^{\circ}^{u}r)$ , $^{TM}$ $^{TM}$ $^{TM}$ $^{T}$ $^{S}$ $^{T}$ $^{S}$ $^{T}$ $^{$ fice to Chemical and other Preciby this decoction process, from the fact that an hour at most will sun cause the precipitation of the dye particles. While believing " $t_{t-1}^{t}$ for pitants undecoction is oxidised by the beating, he repudiates any necessity $^{\circ}$ chemical agencies, stoutly holding that lime or other P $^{\circ}$ P $^{*,nt}_{*,serves}$ serves necessary. 274 only useless but even injurious. He recognises that the beating **par**-also a mechanical purpose by consolidating or agglutinating $r_{\rm int}$ in tides of dye into grains of sufficient weight to cause rapid $\mathbf{P}^{\rm r}|_{\rm cr}^{\rm st}$ unck's Dr. Shortt's essay was published some years after the date or. o Maincd analysis of indigo (1855), and had he seen the admirable results of by that chemist, it is probable, Shortt would not only have been say exnlarpublishing exploded theories but would have recognised that in $r^{r^{-1}}$ nation of the admirable process he was describing centered $f_{-\infty}^{TMnd}$ is the second sec No fermenta-tion. fact that the boiling process dispensed with fermentation. Aaact, dicar obtained, according to Schunck; consists mainly of the gjucosia - r most which, in hot water, especially if slightly acidulated (and the J<sup>uice</sup>, 'r) igo-275plants are in themselves and), will <sup>Sp</sup>lit d <sup>Tef</sup>ly it <sup>O</sup> indigo blue <sup>an</sup>\* joes not sugar. There be ng no fermentation, reduction to indigo blue <sup>an</sup>\* joes not take place; oxidation is, therefore, unnecessary, and alkalies fact <sup>o</sup> such a decoction would prove highly injurious, as they would in with *indican*, compounds from withich indigo could not blee reduction Shortt's processi is so admirably on the lines of the most <sup>recent</sup> inff that it Shortt's processi is so admirably on the lines of the most rece. $\prod_{i=1}^{rece}$ that it opinions that, although defective in some respects, it is surpny g has not been extensively adopted.\* From the beating-vat the fecula is conveyed to the pulp-boilers ds anfic through several strainers, and for this purpose, Shortt recommen to be used in profesence to cotton or flax. After the supernatant or clear through several strainers, and for this purpose, Shortt recommen rownlsin to be used in preference to continuous flax. After the supernatant of clear fluid has been run off the fequila should be freely wand dwith $c_{o'n'}$ clear mater, and as rapidly as possible conveyed through the $\#^{Faine}$ is to the pulp-boilers. If this stage of the operation be delayed, $f^{TM}?^{TM}*TM \land$ the Shortt says, will be set up and the indigo seriously injured. $10' \approx y'$ , the possibility of this he recommends that clean water should be boilers and boilers, and the fecula discharged at once into the hot boilers and $D^{0'}$ if m'

possibility of this he recommends that clean water should be boilea.». boilers, and the fecula discharged at once into the hot boilers and  $\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$  water. The attendant at the pulp-boilers should be furnished win perforated ladle, and with this he should keep stirring the pulp, the mores **b** as it nears ebullition. As it boils it begins to give out a strong sugary odour in place of its former musty smell. It should now be turned out *uy* 

<sup>•</sup> U is almost identically that patented by Mr, F. W. Tytler in May 1888,

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| The' Indigo Plant of Commerce. (G. Watt.) INI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DIGOFERA                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | nctoria                                                                                                                                                       |
| ever, that the process would be improved by the introduction into the<br>beating-vat of an acid to assist in the decomposition of the <i>indie an</i> into<br>indigo-bluc and indigo-sugar. It is even probable that through the aid of<br>acids beating might be found to be altogether unnecessary, though its<br>mechanical action of agglutinating the particles of the insoluble blue<br>dye may always be found of practical advantage. The idea of oxidation,<br>however, either by beating or by direct chemical means, must be rejected as<br>inadmissible, since in a cold or hot acid infusion, where fermentation is<br>prevented, indigo-blue is at once formed, and there is nothing, therefore,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | MANUFAC-<br>TURE.<br>SHORTT'S<br>PROCESS.<br>Fermentation<br>Injurious.<br>276<br>Indican de-<br>composed Into<br>non-dye-<br>yielding com-<br>pounds.<br>277 |
| INDIGO-GREEK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INDIGO-<br>GREEN.                                                                                                                                             |
| Recently, Mr. Richard Olpherts has taken out a patent for the pre-<br>paration of both indigo-green and indigo-blue on a new principle. By<br>gentle pressure of the fresh dye-yielding parts of the plant, which, baled<br>in compressible cases or sacs and deposited in the steeping-vat, on being<br>subjected, under water, to the necessary pressure, yield the dye-substance.<br>The pressure requires to be sufficient to burst or break the tissue of the plant.<br>For the preparation of indigo-green the fluid is run off before fermentation<br>and for indigo-blue after fermentation has taken place. In both cases<br>the liquor is beaten in the lower vat, as already described, the fecula<br>washed, strained into the pulp-boilers, and after being boiled is made into<br>green or blue cakes by the usual process. Many years ago M. Char-<br>pen tier DeCossigny drew attention to the fact that a green indigo could<br>be produced by a process somewhat similar to the above, one of the<br>features of which consisted in crushing the plant. Indeed, so long ago<br>as 1790 Mr. Prinsep sent to England a green indigo which Bancroft pro-<br>nounced a substance analogous to chlorophyl, mixed with a certain pro-<br>portion of ordinary indigo. The exact nature, however, of the green dye<br>obtained from the plant on being crushed by Olpherts <sup>1</sup> process has not been<br>determined. Indeed, the chemist will have to furnish other facts than<br>have as yet been made known before the simple act of crushing can be<br>accepted as producing so remarkable a change in the dye-yielding juice<br>of the plant. | GREEN.<br>278<br>0] herts'<br>Process.<br>279<br>Crushing the<br>Plant.<br>280                                                                                |
| Olpherts has also taken out a patent for manufacturing colour-<br>ed indigoes by chemical means from the waste water of the beating vat.<br>The whole ^subject of the indigo-reds, browns, greens, and yellows,<br>is too imperfectly understood to allow of their being discussed in the<br>limited space at the writer's disposal. The first Aniline dyes (the <i>mauves</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | By-products<br>of the Indigo<br>Factory.<br>281                                                                                                               |

| NDIGOFERA<br>tinctoria. | The Indigo Plant of Commerce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| INDIGO-<br>GREEN.       | with alcohol, was dissolved with oxalic acid, the filtrate (carrying the green in solution) being next treated with carbonate of lime to remove the oxalic acid. By filtration the lime is separated, and by evaporating to dryness the purified green dye is obtained. This substance is solular in water and may be used direct as a dye. Chevreul also obtained green substance which was found to be a mixture of indigo-brown and indigo-blue. The examination chemically of the green dye salid "?, obtained by Mr. Olpherts <sup>1</sup> process, and by a similar method by Mr. Tytic should commend itself to the attention of the chemist. If a green dye carbon dye is simplicity should secure its universal adoption, and it is probable large market may yet be found for an INDIGO-GREEN if such can be act ally manufactured. (See para, below on Green Indigo of ChinOt)                                                                                                                                                                                                                                                                                                                                          |
| COST&<br>PROFIT.<br>282 | COST OF MANUFACTURE AND PROFIT.<br>It is impossible to arrive at any very definite conclusions on this<br>subject, but all authors agree in the opinion that, even at present Pare 4,<br>pays very well to manufacture the dye. Some writers adduce in support<br>of this statement the well-known fact that the planters are often<br>pay heavy interest on borrowed capital and still obtain remumer,<br>returns. Under these circumstances it seems enigmatical that indebted<br>should exist at all, and it is more probable that, as with tea and other<br>fustries, indigo manufacture pays, but does not give the cent per-<br>returns which have been asserted. It is commonly maintained that<br>Madras cultivators are better off than those of Bengal, because the<br>also manufacturers, and that R40 to R60 which they obtain for the math<br>of dye gives them a handsome return. Their capital invested is pro-<br>less proportionately to that of the European, who obtains R200 for<br>same quantity, seeing that the latter also produces a purer artifer.<br>The following statements regarding indigo manufacture are extra-<br>from the report furnished by the Director, Land Records and Agncunu<br>Bengal: |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | IGOFERA<br>nctoria.  |
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| what enormous profits can be made out of the indigo industry—profits so<br>large that the planter can afford to borrow his capital and pay 22 to 23<br>per cent, for charges and interest." The writer regards the above<br>balance sheet as absolutely misleading, though it has been confidently<br>published and republished by several writers since it originally appeared.<br>In addition to the obvious misprint, to which attention has been drawn<br>above, parenthetically, the yield of dye is estimated at three times as high<br>as we ha/e any data to believe it could be, even in Tirhút. The factory<br>is said to have cost about Rso,ooo.<br>The following particulars from a recent official source may be here given<br>regarding the number of employe's and the salaries paid to the same at a<br>Bengal factory:—"The number of persons constantly employed in a fac-<br>tory runs from 25 to 40, but at the manufacturing time there will be from<br>200 to 300. The native employe's are paid from Rio to R30 per month;<br>the more subordinate servants from R4 to R8 per month; coolies from R4 to R6 per<br>month, and at the manufacturing time as high as R8 and R9 per month. | COST ft<br>PROFIT.   |
| "The following are the employe's in a factory at Gya: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Factory              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Employes.            |
| One mukhtar<br>,, karinda • • • • • 8 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 283                  |
| ,, jamadar • • • • • • • • 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |
| , mori mate • • • • • * • 99 4 8 19<br>Nil maha mate • • • • • • • • • • • 99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |
| ,, maha • • » • • • 99 4 0 <b>&gt;</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |
| Chulhakash • • • • • • • • • • • • • • • • • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |
| $Ziladar \cdot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |
| Total 498"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |
| NUMBER OF FACTORIES AND OF EMPLOYÉS ENGAGED ON INDIGO<br>MANUFACTURE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Number of Factories. |
| In Madras a large number of small native factories are returned<br>simply as "Vats," while in the North-West Provinces a very large number<br>are returned as "Factories," which probably have as little claim to that<br>designation as the vats of Madras. Accepting the returns as they stand,<br>there are in all India 2,762 factories and 6,032 vats, and these give employ-<br>ment to 356,675 persons. The greater proportion of the employe's, however,<br>are daily labourers, being engaged during the working season of the<br>factories only. The above estimate of the persons who find employment<br>at Indigo factories does not of course include the rayats who cultivate the<br>plant, although many of these doubtless earn an additional wage from<br>serving as temporary hands at the factories.                                                                                                                                                                                                                                                                                                                                                                                        | 284                  |
| MATERIALS USED IN THE CONSTRUCTION OF INDIGO CASES.<br>The principal Wood for this purpose is the mango, but others may also<br>be employed, but of whatever wood made the cases should be tarred. It<br>is urged by planters that the wood employed should be seasoned for at<br>least one year, since the effect of unseasoned boxes is to cause a difference<br>in the weight at the factory, at Calcutta, or at London. For a list of the<br>woods suitable for Indigo chests see under the heading PACKING CASES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Indigo Cases.<br>285 |
| COMMERCIAL INDIGO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |
| ITS FORMATION, ISOLATION, VALUATION, AND PRICE.<br>This substance is chiefly a product of vegetable origin, but it is found<br>also, under certain conditions, in the blood and urine of animals, and even                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ISOLATION.<br>286    |
| in the milk of cows fed on <i>saintfoin</i> .<br>I. 286                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ł                    |

| appear to exist ready formed. According to the accepted chemical hi<br>tory of the substance, it is derived by the decomposition of a soluble glu"<br>side now known as <i>Indie an</i> . Under certain influences, <i>Indican</i> splits in<br><i>Indigatim</i> —blue-indiga—and <i>Indiglucin, a</i> saccharine substance, solill<br>in water and alcohol. When boiled in nitric acid Indigutin forms oxe<br>acid. In an aqueous, and still more so in an ammoniacal, <sup>solution</sup> ,<br>nitrate of silver, it reduces the salt to metallic silver, and similarly separat<br>gold from the tri-chloride. It is not fermentable but turns acid by pr<br>longed contact with yeast<br>Roxburgh ( <i>Trans. Soc. Arts, Vol. XXVIII.</i> ) supposed the indigo plag<br>to contain only the base of the colouring matter, which of itself was gere-<br>and that alkalies were necessary to eliminate the indigo-blue. Action <b>56</b> , 714<br>of opinion that indigo plants contained a colourless substance cal <sup>Art</sup> ,<br>him <i>Indigogeu</i> , which was soluble in water and possessed more carD<br>than indigo-blue, into which it was converted by the removal of the expt<br>carbon through combination with the oxygen of the air. This<br>"Sitts", the regarded as promoted by heat and by the presence of alkalis sucn<br>line, and as arrested by acids, even carbonic acid. He thus accepted the<br><i>rationale</i> of the process as pursued, <i>vic.</i> , fermentation and subsequent than<br>ment with line. Chevereul supposed woad and other indigo-yieldin<br>plants to contain the soluble or reduced form of indigo Known "", "<br><i>indigo</i> ,—a substance which has one atom of hydrogen more than blue-indig<br>This explanation being extremely simple and in conformity with the trg<br>ment of the colour in the hands of the dyer was for a time very for for<br>accepted. On this theory, to some extent at least, is probably basea.<br>Anglo-Indian method of manufacturing the dye. The fact was loss 1 glants in the <u>or</u><br>cesses of plants, but must necessarily be converted by "", "<br><i>in the sap of plants, but must necessarily be converted by ""</i> , and<br>"the further fact was lost sight of, <i>yig<sub>s</sub></i> (that the leases o | INDIGOFERA<br>tinctoria* | Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| of the chemistry of Indigo, affirms that the juice of most indigo-vienting<br>plants is acid. But Sachs has shown that though the sap in the pare<br>chyma and in the vessels of plants are not invariably distinct, yet<br>most cases the cellular tissue contains chiefly sugar, starch, oil, &<br>and also organic acids and acid saits, and are in consequence acid<br>litmus paper, while the vascular tissues contain mainly albuminoids an<br>give indications of being alkaline. Although the juices of most plants,<br>give indications of being alkaline. Although the juices of most plants,<br>important subject of enquiry—the exact location within the tissue of 1<br>indigo plant of Schunck's Indican. The physical property which pro-<br>plasm exercises, so to speak, atttheseessitieSSI plant organism, in making<br>starch soluble or insoluble, is a potent argument against the advisability<br>accepting as conclusive chemical laboratory experience. Without desire<br>to throw doubt on the value of Schunck's discoveries in the chemist<br>of the indigo derived from indigo-yielding plants, it may be cemark<br>that there are certain phenomena winessed at the indigo factory the<br>suggest the desirability of a thorough examination, both botanically a<br>chemically, of the Indian plant. The results would most probably confir-<br>and in certain practical directions even amplify. Schunck's opinions and ec-<br>clusions. Indigo, as Schunck very property emarks is "a substance with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ISOLATION.               | tory of the substance, it is derived by the decomposition of a soluble glu <sup>co</sup><br>side now known as <i>Indie an</i> . Under certain influences, <i>Indican</i> splits inf<br><i>Indigotin</i> —blue-indigo—and <i>Indiglucin, a</i> saccharine substance, soliible<br>in water and alcohol. When boiled in nitric acid Indiglucin forms ox <i>kn</i><br>acid. In an aqueous, and still more so in an ammoniacal, <sup>solution</sup> of<br>intrate of silver, it reduces the salt to metallic silver, and similarly separate<br>gold from the tri-chloride. It is not fermentable but turns acid by pro-<br>onged contact with yeast<br>and that alkalies were necessary to eliminate the indigo-blue. <sup>AnnODE</sup> / <sup>1</sup> / <sup>1</sup> / <sup>1</sup><br>of opinion that indigo plants contained a colourless substance cal <sup>Aed</sup> .<br>that indigo plants contained a colourless substance cal <sup>Aed</sup> .<br>the regarded as promoted by heat and by the presence of alkalis sucn -<br>the regarded as promoted by heat and by the presence of alkalis sucn -<br>trationale of the process as pursued, <i>vie.</i> , fermentation and subsequent trea<br>ment with lime. Chevereul supposed woad and other indigo-vield in<br><i>Indigo</i> ,—a substance which has one atom of hydrogen more than blue-indig<br><i>ndigo</i> , a substance which has one atom of hydrogen more than blue-<br>indigo. The colour in the hands of the dyer was for a time very $\pounds^{en} f^{ann}$<br>accepted. On this theory, to some extent at least, is probably basea.<br>Anglo-Indian method of manufacturing the dye. The fact was $\int_{en}^{en} f^{ann} f^{ann}$<br>the sape of plants, but must necessarily be converted by $\int_{en}^{ex} f^{ann} f^{annn} f^{ann} f^{annn} f^{annn} f^{annn} f^{annn$ |
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| is formed sparingly indeed, but in widely distant parts of the organic wor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          | indigo plant of Schunck's <i>Indican</i> . The physical property which prot<br>plasm exercises, so to speak, attheseeessitieSSI plant organism, in makin<br>starch soluble or insoluble, is a potent argument against the advisability<br>accepting as conclusive chemical laboratory experience. Without desiru<br>to throw doubt on the value of Schunck's discoveries in the chemist<br>of the indigo derived from indigo-yielding plants, it may be remark<br>that there are certain phenomena witnessed at the indigo factory th<br>suggest the desirability of a thorough examination, both botanically and<br>chemically, of the Indian plant. The results would most probably confir<br>and in certain practical directions even amplify. Schunck's opinions and co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|                                               | Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (G. Watt.)                                                                                                      | INDIGO       |
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| The properties of indig                       | o-blue, which are so peculiar a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | s almost to sepa                                                                                                | rate ISOLA   |
| it from all other orga                        | anic^boaies, and to constitute<br>inquiry, in what form it is co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | it one sui gine                                                                                                 |              |
| naturally suggest the                         | inquiry, in what form it is co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ntained in the pla                                                                                              | ants in the  |
| and animals from whi                          | <u>ch it is defived. It it exisis </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ready tormed in                                                                                                 | the trom     |
| indigo-bearing plants,                        | how is it that though, when in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | a free state, insol                                                                                             |              |
| in water, acid, alkalies                      | , alcohol, a <del>nd most simple m</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | enstrua, it should                                                                                              | 1 so 28      |
| easily be extracted from                      | m tho <del>se plants by a mere infus</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ion with cold wa                                                                                                | er 7         |
| If it does not pre-exist                      | in the plant, in what state of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | compination is it                                                                                               | con-         |
| tained therein, and wh                        | at is the nature of the process                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | by which it is e                                                                                                | ,m-          |
| nated? The usual me                           | thod of preparing indigo from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | the INDIGOPERAE                                                                                                 | con-         |
| <u>–slsts^n^steeping^fi e_</u>                | plant, especially the leaves, i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | n water, orawinį                                                                                                | <u>, on</u>  |
| the infusion, allowing                        | it to undergo fermentation, a<br>with air and the addition of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10 H3^Si=p&Jpfa5piyjg£                                                                                          | fcSS1g       |
| by means of agitation                         | with Bir and the addition of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RUIC-WALCE. INC                                                                                                 |              |
| may be asked, is this p                       | process of fermentation, which                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | is <u>olicen very lee</u>                                                                                       |              |
| and difficult to manag                        | e, essential to the formation of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | naigo-biue, or                                                                                                  | 19 IL        |
| merely an accidental                          | phenomenon attending its pre-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | paration i li it is                                                                                             | ses-         |
| sential, at what stage                        | ynthe process is the format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tion of the colou                                                                                               | ring         |
| matter to be consider                         | ed as completed ; and is it ne<br>ue it until actual putrefaction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | cessary, as some                                                                                                | per-         |
| sons assert; to contin                        | ue it until actual putrefaction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <u>i has commence</u>                                                                                           | 1, Of        |
| notr? These are point                         | s which, though perhaps of littl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | e consequence to                                                                                                | the          |
| dyer and consumer of                          | indigo, are of great interest in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | a chemical poin                                                                                                 |              |
| view, and are of the g                        | reatest importance to the ma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | nutacturer of inc                                                                                               | ligo.        |
| I o the latter it must                        | surely be extremely desirable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ie lo know lne c                                                                                                | xact         |
| nature of the process of                      | on which his manufacture <sub>MAS</sub><br>ields into his hands the whole                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | aa^^moase                                                                                                       |              |
| whether this process y                        | al employed is capable of yield                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ing and also whe                                                                                                |              |
| a manager of conduct                          | cting it is in perfect accordance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | a with theoretical                                                                                              |              |
| quirements " The F                            | Schunck, Philos. Magas. At                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | e with theoretical<br>um these Althe                                                                            | nc-          |
| Schunck mAife Late                            | $\frac{\mathbf{Stright, 1} \mathbf{ntris. magazin ntris.}}{\mathbf{magazin ntris.}}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | $\sim \sim $               |              |
| himself sum un his cou                        | restiB& <u>^^^^aa^ASAa</u> ^<br>nclusions and answer the quest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | on se to the noce                                                                                               |              |
| of fermentation his re                        | esults abundantly do so. Sor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ne twenty years                                                                                                 | otor         |
| Croalzas romarkad=                            | -"What are the chemical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | nhenomena obse                                                                                                  | naesa.       |
| during the process of                         | f the fermentation of the pla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | nt and under                                                                                                    | what         |
| influence and from wh                         | at substance present in the pla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ant is inclian domi                                                                                             | Terri 2      |
| Since no researches or                        | the fresh indigo plants have                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | vet heen made                                                                                                   | and          |
|                                               | different phases of the operative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ms whereby india                                                                                                |              |
| since, moreover, the<br>produced on the large | differe <del>nt phases of the operation of th</del> | ifically exemined                                                                                               |              |
| can therefore only rea                        | son by analogy or from observ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ation of what han                                                                                               | nens         |
| with other similar nla                        | nts, and give an explanation w                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | high is prohable                                                                                                |              |
| not necessarily, correct                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The second se |              |
| It must be admitted                           | that the salient points raised in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | the above onota                                                                                                 | tions        |
| remain to a large exter                       | at unanswered, and that indigo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | manufacture will                                                                                                | CON-         |
| tinue in the position                         | which, until recently, brewing,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | distilling, and n                                                                                               | anv          |
| other such industries w                       | ere, - namely, one of experience                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | e, of tasting, sme                                                                                              | ling.        |
| and guessing,-until t                         | he whole process from the gerr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | nination of the                                                                                                 | dem -        |
| to the production of the                      | he cake has been subjected t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | o a critical exam                                                                                               | nina-        |
| tion by a committee of                        | f botanists and chemists, who a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | done are ever like                                                                                              | ly to        |
| be able to place it c                         | on a platform of scientific accu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | racy. As it seen                                                                                                | ns to la fer |
| the writer, the feature                       | of importance from the manufa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | acturers point of                                                                                               | view tien    |
| is whether fermentation                       | On is a necessity or a consecu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ence of the stee                                                                                                |              |
| vat. If not necessar                          | v.^whether any advantage up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ould comit from                                                                                                 | + <b>L</b>   |
| establishment of a s                          | ystem of manufacture where                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ermentation won                                                                                                 | ld he        |
| _^prevented* <b>Un_this</b> _                 | point Schunck has elucidate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | d certain factor a                                                                                              | abiela       |
| Feem to have been en                          | aris v overlooked, and A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | nm^^^a                                                                                                          | cord-        |
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                 |              |
| ingly beerndirex^a                            | arisl <del>y overlooked, and ^seig/</del><br>ilQffia^s^seeOTa^^^^^<br>in the peating ^^^^ ^^                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | AAAAAEapid S                                                                                                    | 35.          |

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**Commercial Indigo.** 

(G. Watt.)

**ISOLATION.** Schunck next proceeds to deal with the effect of boiling or heating "There is another very remarkable property, he says, which I Indican. have to describe—a property the knowledge of which will probably throw great light on the process of manufacturing indigo. If *indican*, in the form of syrup, as obtained by evaporation of the watery solution, be heated for some time in the water-bath, or if its watery solution be boiled or even moderately heated, it undergoes a complete metamorphosis." When this change has once been accomplished, *indican*, he affirms, " ceases to give the least trace of indigo-blue with acids." It has, however, chemically only taken up the elements of water; but does so more readily if the indican be heated in the presence of alkalies. Instead of indigo-blue and its allied red-colouring matter, it now yields substances which possess no tinctorial property. It may, therefore, fairly be assumed that if the temperature of the sleeping-vat be raised too high, not only will indican be decomposed into indigo-blue, and that substance still further reduced to indigo-white, but that a certain proportion (probably sufficient to materially injure the value of the dye product), will be completely destroyed through its entering into chemical combination with water. And this danger is possibly not confined to the effects of the heat of fermentation in the steeping-vat, but may also take place with the *indican* that may not have been reduced, but carried to the boiler, where the syrupy mass is concentrated. It may, however, be emphasised that these changes can only take place in *indican* as such, and not in the blue indigo obtained by the decomposition of that glucoside. If the fermentation adopted idoes not at once reduce the whole of the *indican*, and the temperature" of the fluid be allowed to rise, the metamorphic change may take place in the vat, or, if undecomposed *indican* passes over to the boiler, it will there undergo a change, producing- dark-coloured compounds to the detriment of the indigo with which it will then be mixed. The enquiry thus seems justified as to whether a process of fermentation in the steeping-vat is the most convenient, economical, and expeditious. In the laboratory Schunck found that *indican*, while undergoing decomposition with acids, "splits up immediately into one equivalent of indigo-blue and three equivalents of sugar." It is, however, possible, he says, "that these three equivalents of sugar may not be eliminated all at once." He concludes his first paper on this subject by three inferences drawn from his experiments with woad :-" i. The Isatis tinctoria does not contain indigo-blue ready formed, either in the blue or colourless state. "2. The formation of the blue-colouring matter in watery extracts of the plant is neither caused nor promoted by the action of oxygen or of alkalies. "3. Indigo-blue cannot be said to exist in any state of combination in the juice of the plant; it is merely contained in them potentially. Indigo is thus one of the colouring materials which, in the passage quoted above, Schunck affirms, can be derived only by a decomposition caused through fermentation or by means of acids. Indican is decomposed even by certain dilute acids in the cold, and more quickly when heated. This decomposition is, for example, induced by tartaric and oxalic acids, and less easily by acetic acid. Schunck gives it the formulae of  $C_{26}$  H<sub>31</sub> NO<sub>17</sub>, and expresses its decomposition thus: CajHaiNOtf +  $_2H_3$  O = C<sub>8</sub> H<sub>6</sub> NO + 3C<sub>6</sub>H<sub>10</sub>O6 Indican + Water = Indigo-blue + Indiglucin. Without experimentally testing the views which a study of the chemistry of this subject induces, it is impossible to suggest practical reforms; but it would seem as if a system of adding dilute acid to a steeping-vat, after a few, hours' maceration, so conducted as to prevent fermentation, might

Isolation of Indigo by means of acids. 289

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| INDIGOFER                                                        | A Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| tinctoria_                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ISOLATION.<br>Native me-<br>thod without<br>fermentation.<br>290 | result in the immediate decomposition of <i>Indican</i> and the formation of Indigo-blue, and thus dispense with the expensive and laborious process of oxidation at present pursued. Indeed, it is probable that the waste product <i>Indiglucin</i> might be utilised as the material from which to manufacture the acid necessary. Were such a system found practical* there can be little doubt but that it would result in the production of a purer article, and one freer from adulteration with the Indigo reds, browns, yellows, and greens which so materially lessen tlu value of the dye as manufacured at the present day. The facts here published seem well worthy the attention of the planter. The old woad manufacturers of Europe extracted their indigo by means of tepid water and lime, a process which rendered fermentation impossible. The use of lime, while precipitating rapidly the indigo-blue when once formed, dqubtess acted injuriously, in that it caused the destruction of a large amount of the <i>indican</i> . Throughout India, wherever the European planters' influence has not extended, the natives extract their blue dyes by a very similar process to that formerly pursued by the woad manufacturers. Thus the Madras method of boiling, as described by Dr. Shortt in the passage quoted above under the Chapter on "Manufacture of Indigo" (p; 43 <sup>*</sup> D) is practically that experimentally tried by Roxburgh and is in principle identical with the old woad method. So in the various provinces of India, a primitive system of manufacture (as it is called) is $^{\text{CM}}$ of as pursued by the Natives, in which fermentation is prevented. 'inus, for example, of the Godavery we read, " a fire-place of mud is constructed sufficiently large to hold sixteen <i>chatties</i> , and in these $^{\text{Chaf}}$ , the plants are placed, and water being poured upon them, the $wfl^{0_{\text{R}}}$ is boiled for an hour and a half. The stalks of the plants are tinent taken out of the <i>chatties</i> and the liquor is poured into large jars fn which it must be well stirred for two hours, the scu |
| Aids to preci-<br>pitation.<br>2QI                               | solution of <i>indican</i> must be obt. ained, and <i>that</i> t <sup>TM</sup> without any fermenta-<br>tion. It is not quite clear what object is served by the subsequent beating<br>of the liquor, but it seems evident that the decoction from the wood which<br>is uccleance auguary producibly contains some acid principle, since * « • • • • • • • • • • • • • • • • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| (commercies) indices $(l = W/att)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IGOFERA<br>nctoria.                                                                                                                        |
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| separated from the fecula, and the addition of foreign substances, like gum, T<br>to assist fermentation, result in the production of indigo very inferior to<br>that made up in factories so called, however well suited to the moderate<br>requirements of the dyers of the country "[ <i>Report of Musaffarnagar on<br/>Dyes and Tans of North-West Provinces</i> ). If would seem highly im-<br>probable that so powerfully astringent a gum as Bengal kino (the gum<br>used in the above process) could assist in fermentation. The process as<br>narrated vould, moreover, lead to the supposition that by cold maceration<br><i>indican was</i> extracted from the twigs, and that the Butea gum assisted<br>in the decomposition of that substance into its blue indigo and sugar.<br>Mr, Sherfff <i>in the Report furnished by the Director of Land Records and<br/>Agriculture, Bengal</i> ) says: "Formerly cold water or weak lime-water was<br>added to the water in which the indigo plant was steeped, to hasten the<br>precipitation of the dye, or as a substitute for beating. But this practice is<br>not followed now by the European manufacturers, nor by native manu-<br>facturers who prepare the stuff for the European market. The use of lime<br>is said to make the indigo hard and red. It is, however, still employed by<br>village dyers in Bengal, who prepare their own dyè. In the manufacture<br>of <i>kachha</i> indigo, or the dye prepared for consumption in the country, the<br>gum of Butea frondosa is added in some parts of the country to hasten the<br>precipitation. Some times the bark of Eugenia Jambolana or of Zyzyphus E<br>Jujuba is also used for the same purpose." The danger of using lime or<br>any other alkali in the steeping-vat, and its utter uselessness for the pur-<br>pose, causing the decomposition of <i>indican</i> into <i>indigoin</i> , has already been<br>deatt with, but the habit of throwing a quantity of cold water into the hot<br>extract or fermented decoction seems well worthy of more careful examina-<br>tion. The three plants mentioned above, as used in Bengal to cause the<br>formation of indigo-blue, are, curiously enough, employed for the sa | Ictoria.<br>SOLATION.<br>ids to preci-<br>pitation.<br>Butea gum.<br>292<br>Lime.<br>293<br>Cugenia bark.<br>294<br>Cold water.<br>295<br> |
| necessary to the decomposition of <i>indican</i> , nor for the formation of its result-<br>ant compounds— <i>Indiglucin</i> and <i>Indigotin</i> . Oxidising agents in the<br>steeping-vat are therefore not only unnecessary and wasteful, but may be                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 296                                                                                                                                        |

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| INDIGOFERA<br>tinctoria.                                | A Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| tinctoria.<br>ISOLATION.<br>Aids to pre-<br>cipitation. | absolutely injurious. An alkali added at this stage to the hot decoction<br>would, however, cause its reduction into three or four useless non-dye-<br>yielding compounds. The juice of the plant is naturally acid, however,<br>and this may be thereby prevented. The solution of Eugenia bark most<br>probably contains the acid necessary to accomplish the complete decom-<br>position of <i>Indican</i> into <i>Indiglucin</i> and <i>Indigotin</i> (blue-indigo), a decom-<br>position which would take place to a certain extent in water alone. This<br>decomposition had better not be fully started however, until iffer a short<br>stage of maceration or careful heating so as to remove the <i>indican</i> from the<br>plant and not decompose it within the tissues, as might take place if boiled<br>at once in a strong acid fluid. The absurdity of fermenting the decoction<br>in order to reduce <i>Indigotin</i> to <i>Indigogen</i> (white-indigo) only to have to<br>reconvert <i>that</i> back by oxidation, either by means of beaters <r patent<br="">chemical processes, is abundantly exemplified by the above simple'process<br/>which, in the hands of a careful manipulator, would, chemically speaking<br/>produce blue-indigo by the direct decomposition of <i>indican</i>.<br/>Eugenia bark could be cheaply enough procured, but its chemical<br/>analysis would reveal the nature of the acid which, in a hot decoction<br/>reduces the <i>indican</i>. The immense volume of indigo-sugar which, from<br/>the factories, is annually poured on the fields as manure, would, "<sup>NOW</sup>X?f"</r> |
| VALUATION.<br>297                                       | suggest the desirability of testing the writer's suggestion of the possibility<br>of utilizing that by-product as the source of the reducing acid.<br>TESTING AND VALUATION OF INDIGO.—AS met with in the market the<br>approved form of the dye occurs in small cubic pieces; when of good quali-<br>ty these are so light as to float on water. They are of a violet-blue cowj <sup>*</sup><br>and assume a coppery aspect when rubbed with a hard polished $y^{0/2}$<br>They are free from flaws or cavities and are not traversed by veins $\alpha$<br>white or brown. Good sorts contain from 50 to 60 per cent, of •>>><br>gotin <sub>2</sub> but in addition to the existence of other products of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| adul tera-<br>tion.<br>298                              | position of <i>indican</i> , such as red-indigo, brown-indigo or indigo-gu <sup>111</sup><br>mechanical impurities are to a certain extent unavoidably present. 1 <sup>144</sup><br>percentage of dirt is, however, greatly reduced by careful and clean manu-<br>facture. The inferior sorts of indigo contain a large amount of fraudulent<br>ly, added dirt, such as sand, peculiar muds, starch, powdered lead, *c<br>1 he decline of the Bombay indigo manufacture is generally attributed to<br>the adulteration practised. Of Khandesh it is said, for example, that wood<br>ashes are used in adulteration. In the Manual of the Cuddapah district<br>Madras, it is reported that there occurs a sort of bluish mud which isuses<br>in adulteration of indigo. "The demand for the silt is so great that <u>i</u><br>has become an article of commerce : it is collected and sold in the bazar<br>and is readily bought up by some native vat-owners during the manufac<br>turing season at 8 annas a maund." A number of similar paf?***<br>might be quoted from nearly every district of India where native mdigo i<br>made. It may have been inferred from what has already been said tha<br>the Indian dyers recognise two primary kinds of indigo : (a) that made DY<br>or on the principle pursued by, European planters, namely, of boiling down<br>the decoction to a thick syrup and compressing the same into cakes, A nes<br>is generally spoken of as "boiled" or "English indigo;" (b) that made<br>faf the <sup>10 c &amp; 1 market</sup> <sup>in wn</sup> ch the decoction is thrown into moulds ana               |
| PURIFICA-<br>TION.<br>299                               | allowed to dry slowly at the ordinary temperature of the atmosphere. A n<br>latter IS^ generally known as gad indigo.<br>Various methods exist of preparing pure indigo for laboratory pur<br>poses and of estimating the actual percentage of <i>indigotin</i> in commercia<br>cakes It may be purified from most of its foreign matters by treating i<br>successively with dilute sulphuric or hydrochloric acid, with boiling water<br>and with alcohol. But the most thorough method is to have resort to th<br>I. 299                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| Commercial Indigo. ((J. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | DIGOFERA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| ti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <u>nctoria.</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| principle of the vat, in making soluble indigo-white, removing the insoluble materials by filtration, and from the filtrate throwing down the insoluble blue-indigo. The weight of the dry indigo-blue to the original weight of the sample is relatively the amount present. The sample should be first dried over the water-bath to ascertain the amount of moisture present. In good samples this should not exceed 3*5 to 6 per cent. The amount of ash may next be determined by calcining a certain amount in a platinum crucible. <sub>0</sub> Good indigo generally yields only 7 to 10 per cent. The exact amount of sand or other mechanical impurities may be discovered by washing out the soluble ingredients of the ash. The detection of the presence of starch is more difficult. If the starch has been coloured blue by iodine the indigo cake is pale coloured, has a great density and friability. The actual presence of starch may be demonstrated by treating the indigo with sightly alkaline water, neutralising the filtered liquid with a few drops of acid and testing with iodine. The characteristic blue <sup>r</sup> eaction will be restored proving the presence of starch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| DECOMPOSITIONS OF INDIGO.—Indigo-blue melts and boils when heated<br>in contact with air. At high temperatures it burns with a bright and<br>smoky flame. Dry chlorine does not act on it between o° and ioo°C,<br>but if indigo-blue be stirred up with water in a paste, and chlorine passed<br>through it, the mass becomes first green then yellow. A similar decompo-<br>sition takes place with bromine and with iodine when heated. When<br>boiled with nitric acid it is converted into <i>isatin</i> with the evolution of gas<br>Concentrated chromic acid immediately decomposes it with violent evolu-<br>tion of carbonic anhydride. Sulphuric acid acts as a solvent forming the<br>so-called INDIGO-EXTRACT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PRICE <i>OF</i> INDIGO.—There is perhaps no other article that fluctuates so<br>much as does indigo. The mean annual price varies from year to year<br>according to production and demand, but the outturn of each factory also<br>varies from day to day, depending mainly on the condition in which the plan<br>reached the factory, the nature of the available water, the temperature a<br>the time of steeping, and the success or failure of the manufacturers' in<br>structions as to steeping, fermenting, beating, boiling, drying, cleaning<br>and packing. One point on which all writers agree is, that the yield and<br>quality of dye is greatly injured if fermentation be set up in the leaves be<br>fore maceration, and accordingly wet leaves are never collected. It seem<br>quite possible that wet leaves closely packed together would originate<br>certain amount of decomposition of <i>indican</i> within the tissue, the insolubl<br>blue-indigo becoming imprisoned as it were, and the leaves according!<br>dyed. Considerable experience is also necessary as to the exact age a<br>which the plants should be cut, for it seems established that there is a period<br>of maximum yield beyond which the leaves give less and less, and befor<br>which they also afford an inferior yield and quality of dye. All these dan<br>gers and precarious conditions have to be guarded against, and hence, wit<br>no chemical apparatus to forewarn him, the manufacturer must offen fa<br>and thus produce one day an article of much less value than another. In<br>carefully worked factories each day's manufacture receives a current num<br>ber, and the various days' productions are never mixed, so that each cas<br>of indigo may be depended upon as being of one quality. This has gread<br>ly raised the reputation of high merit for Bengal indigo, and enables larg<br>consignments to be sold on approved samples. With Native manufacturers, each producing a few maunds, or it may be only pounds, this<br>quite out of the question, and consequently Native indigo often fetches re<br>latively a far lower price than it merits. The whole traffic in Native Ind<br>go is, a | <b>301</b><br><b>301</b><br><b>5</b><br><b>1</b><br><b>-</b><br><b>5</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>s</b><br><b>a</b><br><b>e</b><br><b>y</b><br><b>t</b><br><b>1</b><br><b>-</b><br><b>e</b><br><b>b</b><br><b>i</b><br><b>i</b><br><b>i</b><br><b>i</b><br><b>i</b><br><b>i</b><br><b>i</b><br><b>i</b> |

each small consignment for the actual amount of dye it contains. One

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| INDIGOFE                                | Commerciar murgo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|
| · PRICE.                                | sample may be sold for relatively more than it is worth; another for con-<br>siderably less. Fraudulent adulteration is the main cause of the low<br>prices realised for Native indigo. The prejudice against it is in fact<br>likely to survive long after any possible education into the advantages<br>of producing a cleaner article, so that the course of reform is necessarily<br>slow. The small Native manufacturer, obtaining, as he does in Madras,<br>some R30 to R70 for a maund of his adulterated article, is handsomely<br>rewarded for his labour and capital expended, and he is but <sub>r</sub> little inter-<br>csted in the news that his Bengal contemporary can earn R200 a mauna<br>more than is obtained for Madras indigo.<br>The price of the dye will be found dealt with in various places in this<br>brief summary of the main facts regarding Indian indigo. The reaaer<br>referred to the chapter on the History of the Dye where the valuations are<br>given of samples of good quality in 1810 as furnished by the ^?^ <sup>r</sup> _js.<br>Directors of the East India Company. In the chapter on the "Chemi-<br>try" and also on the "Trade in Indigo" the prices ruling <sup>bot</sup> /V"<br>England and India have been discussed. Mr. d. E. O'Conor .ot inc<br>Finance and Commerce Department has obligingly furnished the followi "5 |  |  |  |  |  |  |  |  |  |  |  |
| Conf. with<br>prices in<br>1810, see p. | facts:—<br>"Price of Indigo (Middling to Good) in Calcutta in the seasons ot—<br>R<br>1887 November • , 232J per Factory maund.<br>" December . • . 230 " i»                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |
| 395.                                    | ,, January to February, 210,, >91888 November,, December to February215,, >8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  |  |  |
| •                                       | "Average prices of Bengal Indigo in London—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1880 75. 21 d. per Ib.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |  |  |
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|                                         | 1883 • • • • • <u>5</u> \$. 10 <del>j</del> d. •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  |  |  |
|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |  |
| 1                                       | 1885 • • • • • 55. 37 <i>a</i> . »<br>1886 • • • • • 55. 1 <del>2</del> <i>d</i> . »                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1887 • • • • • 4s. 10 <sup>3</sup> d. »                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1888 • • • • • <b>4</b> \$. 9 <b>\$</b> <i>a</i> ; "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1889. 4*« 7f<*' <sup>▷</sup> <b>ĸ</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  |  |  |
|                                         | The fall in the price shown by the above figures is all the more remaring<br>able when it is recollected that India now holds a practical monopoly $\mathbf{A}_{\mathbf{a}}$<br>the world's supply of the dye. This is doubtless to some extent $\mathbf{A}_{\mathbf{a}}^{a}$ as $\mathbf{A}_{\mathbf{a}}^{a}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |  |  |  |  |  |
|                                         | increased production of Madras indigoes, indeed, of indigo generally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |  |  |  |  |  |
|                                         | The following table also furnished by Mr. O'Oonor exhibits the com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |  |  |  |  |  |  |  |
|                                         | parative fluctuations in the value since 1850—<br>Variations in the wholesale prices of Indigo in London, expressing the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |  |  |
|                                         | average of 1845-50 as 100,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1845-50, average of 6 years • = 100   1868 ist • • • • 54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |  |  |  |  |
| •                                       | 1851 1st January 128 1869 ist "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 1857 ist ", 121 1871 ist ", 137                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |  |  |
| 1                                       | 1858 ist January • • 163 1872 1st " • • 169                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  |  |  |
|                                         | 18661st ", 126 1873 1st July 124                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  |  |  |
| ť.                                      | 1867 ist " • • 145 1874 lst January • • • 123                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |

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|                               |     |                | Co              | mmercial             | Indigo.                           | (G.    | Wa   | utt.) |     | DIGOFER A<br>inctoria. |
|-------------------------------|-----|----------------|-----------------|----------------------|-----------------------------------|--------|------|-------|-----|------------------------|
| Variations in the             | he  | whole<br>avera | esale<br>ige of | prices of<br>1845-50 | Indigo in Londor<br>as ioo—contd. | n, exp | ress | ing t | he  | PRICE.                 |
| 18741st <b>J</b> uly          |     |                |                 | 156                  | 1882 ISt January                  |        |      |       | 195 |                        |
| 1875 1st January              | . ' | •              | •               | 157                  | ist July                          | •      | •    | •     | 188 |                        |
| , 1st July                    | •   |                |                 | 150                  | 1883 ISt January                  | •      | •    | •     | 190 | Ì                      |
| 1876 1st January              |     | •              | •               | 130                  | ISt July                          | •      |      | •     | 144 |                        |
| , 1st July                    |     |                | •               | 137                  | 1884 ISt January                  |        | •    | •     | 151 |                        |
| 1877 1st Jamniy               |     | •              |                 | 173                  | 1 1st July                        | •      | •    | •     | 167 | ļ                      |
| ,, 1st <b>]</b> u <b>jy</b> ⊧ |     | •              | •               | 147                  | 1885 1st January                  | •      |      | •     | 157 |                        |
| 18781st January               |     | •              | •               | 169                  | ISt July                          | •      |      | •     | 133 |                        |
| " 1st July                    |     |                | •               | 164                  | 1886 ISt January                  | •      | •    | •     | 153 | 1                      |
| 1879 1st January              |     | •              | •               | 167                  | st ist July                       | •      |      | •     | 130 |                        |
| " ist July                    | •   | •              |                 | 169                  | 1887 ISt January                  | •      |      | •     | 131 |                        |
| 1880 ist January              |     |                |                 | 20.5                 | ⇒ ist July                        | •      | •    | •     | 131 | ŀ                      |
| ist ibly                      |     |                | •               | 206                  | 1885 ISt January                  |        | •    | •     | 129 | 1                      |
| 1881 ist January              |     | •              | •               | 197                  | , ist uly                         |        |      | •     | 129 | 1                      |
| " ist July                    | •   | •              | •               | 189                  | 1889 ISt January                  | ٠      | •    | ٠     | 125 | }                      |
|                               |     |                |                 |                      |                                   |        |      |       |     | ar man and a man       |

### **INDIGO SUBSTITUTES.**

SUBSTITUTES.

Blues derived from Coal Tar.—Mr. Alfred H. Allen {President of the Society of Public Analysts) has done a good service to the indigo industry, by making known the exact position of the chemical investigations which have been conducted with the aim of producing chemical indigo from coal tar. The complete success that attended the artificial production of madder, and the consequent collapse of the European trade in cultivating the plant (Rubia tinctorium) and in manufacturing the dye, gave to the enquiry into artificial indigo a seriousness that could not be ignored. The result wzs awaited anxiously; but, for the present at least, it may be said that the Indigo Planter is left master of the situation. Mr. Allen has pronounced the chemists' endeavours as unsatisfactory from a practical point of view; for, while he can now produce "Indigotin," he cannot do so at a price to compete with the natural product. The following interesting passage may be here given from Mr. Allen's report:—

'• If a piece of cotton be introduced into a vat, containing the solution of reduced indigo, the liquid penetrates to the interior of the fine tubes constituting the fibres of cotton, and on subsequently exposing the material to the air, oxidation takes place, the insoluble blue-colouring matter is formed, and, being in the interior of the fibre, the goods are dyed a fast blue, incapable of removal by washing, and wholly unacted on by light, soap, or diluted acid or alkaline liquids. By chloride of lime the colour may be bleached, but this has a distinct practical advantage, for a white pattern may be produced on a uniformly blue ground by restricting the treatment with the bleaching agent to those parts of the cloth from which a discharge of the colour is desired. Some years since, by a series of highly complex and ingenious processes, artificial indigotin was obtained from Coal-tar. Owing, however, to the extremely tedious character of the preparation and the unavoidable loss occurring at certain points of the process, resulting in the formation of a large proportion of valueless products, the production of indigo from Coal-tar has not proved an industrial success, and the manufacture has been almost discontinued, and doubtless will be entirely so when the present stocks are exhausted. The artificial indigo from Coal-tar is identical with the natural product in every respect, and it is merely a question of *price* which has prevented it from superseding the colouring matter made in nature's laboratory.

'• But this question of price has been settled, for the present at any rate, in favour of the natural products. The case is not parallel to that of Alizarin, the colouring matter of madder, the synthesis of which from Coaltar has resulted in the complete abandonment of the cultivation of madder.

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Artificial Indigotin,

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| Commercial Indigo.                                                                                                                                                                                                                                                                                                          | (G. Watt.)                                                                    | INDIGOFERA<br>tinctoria.      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------|
| suited to Indigofera tinctoria. Should this idea be<br>indigo-production might be greatly extended and le<br>from an internal rather than an external influence<br>be found of three indigo-yielding plants which are<br>as a source of dye. Thus under the Chapter on "<br>allusion has been made to samples of Nerium ind | essened prices re<br>e. Brief notices<br>e regularly emplo<br>History of Indi | esult<br>will<br>oyed<br>go'' |

Wrightia tinctoria, the *Pala* indigo of Madras) as having been sent from Madras to the Board of Directors of the Honourable East India Company for examination. This easily-grown tree yields a large supply of leaves annually, and might be made a source of dye at a nominal cost. Numerous papers will be found on this subject in the earlier volumes of the Journals of the Agri-Horticultural Society of India, but Mr. Fisher's report, Vol. IV. (Selections), 129–131, may be specially consulted.

In the "Chapter on Cultivation of Indigo" two other indigo-yielding plants have been mentioned. Under the account of Bombay and of Ráj-, put ana reference has been made to Tephrosia purpuiea. The Indigoes of Egypt and of the Niger in Africa, are obtained from species of that genus, and it is probable Tephrosia mipht be successfully grown in many parts of India where Indigofera would fail. In the account of Indigo cultivation in Assam, a brief passage has been quoted from the writer's account of the *Rum* dye of the Eastern side of India—the produce of Strobilanthes flaccidifolius. It does not seem necessary to comment further on this subject, suffice it to add that much of the dye of China is obtained from this source, and that long ago Fortune (*see Chinese Indigo by R. Fortune*<sub>9</sub> *Jour, Agri.-Hort. Soc. hid., IX., Sel. 34*) urged the value of this plant. It was apparently first botanically made known to Europe through Dr. W. Griffith, who found it in the Mishmi Hills.

Besides the above there are other Indian plants known to yield the dye. The hill tribes on the Himálaya extract indigo from several plants, but more especially from Marsdenia tinctoria (the ryom of the Eastern division), a creeping Ascjepiad.\* In Java M. parviflora is cultivated as a source of indigo. The Yoruba Indigo of West Africa is obtained from Lonchocarpus cyanescens, Bth. Isatis tinctoria—the woad—yields the Indigo of Afghanistan and of some parts of China. In Burma two plants not as yet mentioned are said to afford indigo, vie., Gymnema tingens, an extensive asclepiad climber, and Acacia rugata, a small tree, probably only a variety of A. concinna, the soap-nut tree. In Cochin China a composite plant, Spilanthes tinctoria, is cultivated as a source of indigo. Many other plants are also reported to yield the dye, though little advantage is taken of these sources of blue-dye. Thus, for example, the leaves of the custard apple, Anona squamosa, and of the gram plant, Cicer arietinum, yield indigo. In Russia, Polygonum tinctorium is grown as a source of the dye, and it is probable several of the Himalayan species might be so used. The fruits of two or three Polygonums afford a pulpy substance which dyes the fingers blue on being squeezed, and the young cones of Abies Webbia<sup>^</sup>a afford a curious purple dye, which is probably a form of indigo. The tree is known to the hill tribes of the Western Himalaya as the Indigo-fir.

The study of all the indigo-yielding plants should commend itself to the attention of planters.

GREEN INDIGO OF CHINA AND OTHER REPUTED GREEN DYES.

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In the concluding paragraphs of the Chapter on the MANUFACTURE OF INDIGO reference has been made briefly to the processes of making Indigo-green. That substance should not be confused with Chinese

a \* For further information on the Indigo from Marsdenia> see Vol. V.

|                                         | · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDIGOFER<br>                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| GREEN DYES.                             | green-indigo, which, in all probability, is not obtained from the Indigo<br>plant at all; if, indeed, it can be accepted as anything more than a com-<br>bination of two materials resulting in a green dye. This subject is,<br>however, 2t present too Hitle known to allow of a succinct review of the<br>literature, and little more therefore can be here done than to furnish the<br>reader with references to the chief works which treat of it. The writer,<br>in his Calcutta International Exhibition Catalogue, referred to four re-<br>puted Indian green dyes, <i>viz.</i> , Baccaurea sapida, Gymnéma tingens,<br>Hedyotis capitellata, and Jatropha glandulifera. These will be found<br>treated of in their respective places in this work. But the two former are<br>affirmed to be used in conjunction with other substances, so that they may<br>be set on one side. The two latter, on the other hand, are reputed to yield<br>a green dye without the aid of any other dye-stuff. Gamble, and ais <sup>9</sup><br>Schlich, speak of Hedyotis as the Lepcha green dye. <sup>n</sup> The green leaves<br>are put into water and infused and the cloth to be dyed is steeped in the<br>infusion." Dr. Thomson, in the Journal of the Agri-Horticultural <sup>Srovie</sup> v<br>of India (1862), described the process of preparing the green dye trom<br>Jatropha, and it is somewhat remarkable that neither of these green dye<br>they been put to any practical use. If it be the case that Jatropha g? <sup>adtro</sup><br>lifera yields the dye said to have been prepared from it, an unlim <sup>4</sup> te-<br>supply mierht be obtained in Bengal, since the plant is one of the <b>most</b><br>prevalent of roadside weeds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Green Indigo<br>Of China.<br><b>307</b> | Subsequent to the appearance of the Catalogue cited above, the wn of<br>published in the Colonial and Indian Exhibition Catalogue an account<br>what promises to be another subject of future interesting investigation,<br>A sample of Kampti green dye was procured, the plant from which for<br>said to have been obtained proving the common pulse Vigna<br>and the transfer of the same and twigs were reported to yield on dec<br>for a fluid which, with the fruits of Garcinia pedunculata, produced<br>indigo which, with the fruits of Garcinia, would form green,<br>a recent communication, however, Mr. H. Z. Darrah (Director, L'ar<br>Records and Agriculture, Assam) throws some doubt on the *ccreation<br>the above information. He describes an Assam green Prepare?, 111<br>ram-indigo with turmeric and the leaves of <i>urohi mahorpat</i> (* Vig *>><br>He adds that the leaves of the common plum may be used in place <i>QI</i><br><i>urohi</i> ; the plum referred to is probably Zizyphus, a plant allied to Rhammus.<br>Major Hannay (Note on the Dye-stuffs of Assam, <i>Jour. AgrirHorty</i> **;<br><i>Ind., VI. (Old series), p. 69</i> ) describes another Assam green prepared with<br>r <m-indigo, <i="" being="" employed="" the="" yellow="">Mishmi-teet (Coptis 1 estator).<br/>Throughout India, however, greens are produced with indigo and some<br/>vegetable yellow, so that little novelty exists in observations of that nature.<br/>In an account of the Resources of Pegu {Jour. AgriHort, Soc., 1**<br/>SeL 54,) it is stated that the leaves of Photinia serratifolia (? a form 01<br/>P. Notoniana, W. fcf A.) yield a green dye. The writer can find no con-<br/>firmation of this statement. Mason alludes to the above plant (on in<br/>authority of McClelland) as the <i>donk-yat</i> of the Burmese, but he, de-<br/>scribes in another page a green dye as prepared by the Burmans trom<br/>turmeric and the leaves of the soap-nut Acacia. In Volume II. 1*.'''<br/>Series), p. 251, mention is made by Mr. A. H. Landers (Vegetable ana<br/>other Products of the Shan Country) of a green vegetable dye of a fading<br/>colour, which, he remarks, would no doubt be lasting with mordants.<br/>Turning now to the info</m-indigo,> |

| Commercial Indigo. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | INDIGOFERA<br>tinctoria.                                                                                                                                                                                                                  |
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| of the AgriHorticultural Society of India. In Volume VIII., Old S (1854), 232, Mr, T. F. Henley addressed the Secretary of the Soc recommending that Mr. R. Fortune's attention (during his contempl travels in China) should be directed towards investigating the so of the famed green-indigo. Mr. Henley referred the Secretary to M sieur Persoz's account of the substance which had then only, recompeared ( <i>in Comptes Revdus de V Academie des Sciences</i> , October 1 A copy of M» Persoz's memoir was furnished to Mr. Fortune along a grant of £50 to be spent on plants and seeds including, if possible, to of the green indigo shrub ( <i>Proceedings, clxxxiii.</i> ). In vol. IX., is published Mr. Fortune's "Account of the Chinese Green Indigo I with specimens of the dye." Mr. Fortune in the above paper expr his satisfaction that the green dye plant forwarded by him had received in safety by the Society. He then proceeds to say that he f that the seeds of a cultivated along with a wild form of the plant used in producing the dye. He performed the experiments for hi as described by his Chinese informants. "The extract," Mr. For wrote, "from the seeds of the cultivated species which I have evapor on paper, is yellowish in colour, while that from the wild kind is of a plish or violet tint, and apparently very beautiful. These mixed tog give a green of various shades, according to the proportion of each and this colour is much varied and improved by the addition of a sulphate of iron, and such substances used as mordants by dyers. | tinctoria.<br>eries<br>GREEN DYES.<br>Green Indigo<br>of China.<br>ource<br>Mon-<br>ently<br>852).<br>with<br>those<br>105,<br>Plant<br>esses<br>been<br>ound<br>were<br>mself<br>tune<br>rated<br>pur-<br>ether<br>kind,<br>alum,<br>The |
| Chinese invariably informed me the seeds were em ployed" to paper<br>and that cotton and silk fabrics were dyed with the bark." Mr. For<br>after sonte trouble found that the chief seat of the green dye (or <i>La</i><br>manufacture was at Kia-hing-fu situated between Hung-chon-fu<br>Shanghai, and as he was unable to visit that city he communicated<br>Dr. Lock hart, who entered warmly into the investigation. Mr. For<br>then adds that on reaching Shanghai later in the year he found tha<br>Rev. Mr. Edkins had, on passing through Kia-hing, procured a bu<br>of the chips. Speaking of these chips he remarks:" Dr. Lockhart had<br>pared the extract by boiling down a decoction obtained from them."<br>page 274 a further communication from Mr. Fortune is given whe<br>furnishes a passage from a letter received from Dr. Lockhart in whic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | only,<br>tune<br>okao)<br>and<br>with<br>tune<br>t the<br>undle<br>pre-<br>At<br>re he<br>h the                                                                                                                                           |
| process of preparing the dye is carefully described- The barks of<br>wild plant called WHITE and of the cultivated called YELLOW are bin<br>in iron pans.<br>.'' The residuum is left for three days, after which it is placed in<br>earthen-ware vessels, and cotton cloth prepared with lime is dyed w<br>several times. After five or six immersions the colouring matter is way<br>from the cloth with water and placed in iron pans to be again boiled.<br>colouring matter is taken up in cotton yarn several times in succe-<br>and then washed off and sprinkled on thin paper. When half dry<br>paper is pasted on light screens, and thoroughly exposed to the sun.<br>produce is called <i>Luk-kaon</i> . In dyeing cotton cloth with it ten par                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | boiled<br>large<br>vith it<br>ashed<br>The<br>ssion,<br>v, the<br>The                                                                                                                                                                     |
| <ul> <li>mixed with three parts of sub-carbonate of potash in boiling water."</li> <li>dye obtained "does not fade with washing, which gives it a super over other greens"</li> <li>In the same article Mr. J. Me Murray, Head Gardener to the So described the process he had pursued in cultivating the plants and of the Chinese green dye, obtained from Mr. Fortune. Dr. Tho (then Superintendent of the Royal Botanic Gardens) identified the as a species of Rhamnus. Reprinting from the Pharmaceutical Jo and Transgestions the Agri Hortigultural Society in their Salestions</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The<br>riority<br>ciety,<br>seeds<br>mson<br>plant<br>punnal                                                                                                                                                                              |

• and Transactions the Agri-Horticultural Society, in their Selections, page • no, gives Mr. Daniel Hanbury's paper on the notes furnished him by

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| <b>INDIGOFERA</b>                                       | Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _tinctoria<br>GREEN DYES.<br>fipeen Indigo<br>of China. | Commercial Indigo.<br>Dr. Lockhart. These are in substance the same as briefly indicated<br>above; Dr. Lockhart appears thus to have sent the same information<br>both Fortune and Hanbury.<br>In the Proceedings to Volume IX., the Society's Hardener $e^{2}n^{11}n^{1}$ , A<br>to report most favourably of the progress made with Mr. Fortune s, $t^2$<br>dye plants, but the interest in thm seems to have died out about t <sup>heff</sup> .me<br>a translation appeared (by Mr. H. Cope) of Monsieur Natalis IRe <sup>-1</sup> A <sup>11</sup><br>most elaborate and instructive paper on "The Green Dye 0/ Ching, and<br>Green Dyeing of the Chinese." This will be found in Volume *. $t^{2}n^{-1}$ and<br>that the first European mention of this green indigo occurred in 1845, but<br>that the discovery of the properties of the dye only dates from is $5^{-} *^{11}$ and<br>that the discovery of the properties of the dye only dates from is $5^{-} *^{11}$ and<br>but only a passing notice was taken of it. According to the $t^{1}$ by $t^{1}$ by<br>Edkins' nomentionisismed of the present century. In Volume XL or<br>that the direct of the Green Indigo of China and the Green Dyeing of $t^{11}$ by $t^{11}$<br>Chinese, and although in D. Hanbury's Science Papers and other mod<br>that it is prepared from two species of Rhamus ( <i>vie</i> , R. davaricus, <i>t</i> and<br>that it is repared from two species of Rhamus ( <i>vie</i> , R. davaricus, <i>t</i> and<br>and R. tinctorius, Waldst. et Kit.). Although India possesses some and<br>indigenous species of Buckthorn none of them are reputed to yield to<br>to the advance made in the production of green dyes find "Advance<br>significant, however, that a Zizyphus (a genus closely allied to Rma <sup>4</sup><br>significant, however, that a Zizyphus (a genus closely allied to Rma <sup>4</sup><br>as synonyms. If this reduction be confirmed the India possesses one in<br>the that in the Flora of British India under "D. dahuricus" the plants a<br>soribed as R. globosus, Bunge, and R. virgatus, Roxb., have been inclua or<br>significant, however, that a Zizyphus (a genus closely allied to Rma <sup>4</sup><br>as synonyms. If this reduction be confirmed |
|                                                         | green, and other such cheap colours prepared from coal-tar. The<br>of such a trade are dependent, as indeed is the continuance of indigo, $upq_{ac}$<br>whether or not it can undersell the Aniline dyes. The Indian $^{s}\Lambda' rz$<br>are all temperate plants, and even if found to afford the dye could not oe<br>so easily grown on the plains of India as the more tropical Chinese species-<br>Father Helot describes the preparation of the green dye thus r—The fresn<br>bark of the species known in China as <i>hong-pi-lo-chou</i> is boiled with water<br>and left standing in the liquid for two days: the preparation of the decoc-<br><b>I</b> . $307$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

<u>ني يە</u>

| <br> | <br>C | ommerc | ial ] | Indigo | • | ( <i>G</i> | . W | att.) | <u></u> | DIGOFERA<br>inctoria. |
|------|-------|--------|-------|--------|---|------------|-----|-------|---------|-----------------------|
| <br> |       |        |       |        |   |            |     |       |         |                       |

tion from the other species *p4-pi-lo-chou* is continued for ten days. Each GREEN DYES. of the decoctions is used separately, and on each occasion lime water is Green Indigo of China. The fabric is dipped in the former decoction seven to ten times added. and in the latter three times, but the fabric is allowed to dry between each immersion. The drying is effected on meadows where the cloth is spread out at about night-fall and left until noon of the next day. Only the side of the fabric exposed to the sun becomes coloured, from which circumstance it L inferred that sunlight is indispensable to the formation of Lo~ kao. The process of preparing Lo-kao as a pigment or dye-stuff (described above by Fortune) is thus quite different from the process of dyeing with the fresh barks as employed by the Chinese. In the former a fabric is used to remove the dye, the excess being brushed and washed off and then exposed to the sun on paper so as to cause the change necessary to its formation. In the latter the change effected by the sun takes place on the fabric, the exposed surface being dyed. In M. Michel's experiments with Rhamnus Catharticus, as with the Chinese Rhamnus barks, the surface of the fabric exposed became green coloured, but if prepared Lo-kao be used as a dye both surfaces of the fabric are dyed, since the tinctorial agent employed has already been acted on by the sun.

The berries of a species of Rhamnus are sold in Europe under the name of Persian Berries. These are largely used in calico-printing for steam-orange, olive, green, &c, and this dye exhibits certain actions under the influence of light analogous to the reaction indicated above in the formation of *Lo-kao*. This is especially seen when copper sulphate has been used as a mordant. The olive colour imparted by the berries gradually becomes deeper in colour, but after twelve months' exposure to light the olive green produced becomes as fast to light as vat indigo. These berries are obtained from several species of Rhamnus, wild or cultivated, in France, Spain, Italy, Turkey, the Levant, or Persia. In addition to the works named, the reader may consult the following:—*Crookes, Dyeing and Calico-printing*, 428—435; Hummel^ the Dyeing of Textile Fabrics, 366 i Spans' Encyclopedia 2 Balfour, Cyclopaedia; Linn, Soc. Journals, &c

### CHEMISTRY OF INDIGO.

#### THE EXPLANATION OF ITS TINCTORIAL REACTIONS.

The Indigo of Commerce varies greatly in quality and purity, and its value, therefore, depends upon the proportion of actual colouring matter contained. Thus good indigo, according to Mr. A. H. Allen, ranges from about 45. to 55. 6d. per Jb-the proportion of colouring matter being about 50 to 70 per cent. Good Kurpah (Cuddapah) indigo ranges from 2s. gd. to 35. qd. per lb, and usually contains 33 to 52 per cent, of colouring matter. Oudh is generally similar to Kurpah in price and richness. Good Java indigo contains from 60 to 80 per cent, of colouring matter, and ranges in price from 5s. to 6s. 6d. There are many low qualities of indigo as, for example, the so-called "Fig "Indigo, which sometimes contains only 6 to 9 per cent, of colouring matter. "From a list of the prices and richness of various parcels of indigo sold in London, it appears that the lower qualities usually fetch a higher price per unit of colouring matter contained than is the case with better kinds. On the whole, it may be taken that the unit of colouring matter in indigo has a present market value of about *id.* per lb, or perhaps, more strictly, 15–12 of a penny. There are many exceptions, however, as some dyers are will ing to pay rather more for a particular quality, which their experience or fancy leads them to prefer. In some cases, certain dyers will cons.der that Oudh indigo gives the best results, and they will buy Oudh indigo only; while others doing exactly the same kind of work, find that Oudh

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| INDIGOFERA<br>tinatorio | Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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|                         | will not answer their purpose, and will use only Bengal indigo, and so on<br>The dye-colouring matter of the commercial articles has been subjected to<br>the most careful chemical analysis, and, as stated, has received the "*" of<br><i>Indigotin</i> . The commercial article contains, however, in addition the sub-<br>stances known as indigo-red, indigo-brown, indigo-gluten, and a num<br>of brown residus products which have not as yet been fully determined.<br>Without entering into the history of the development of our knowledge A<br><i>Indigotin</i> further than has already been indicated, it may suffice to sthe-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formula C <sub>8</sub> H <sub>5</sub> NO (or C <sub>16</sub> H <sub>10</sub> N <sub>2</sub> O <sub>2</sub> ). It is insoluble in water, <i>at</i> , hol-<br>formitian supplus and partities at a boiling heat, but on cool-<br>maniline, also dissolve small quantities at a boiling heat, but on cool-<br>ing <i>Indigotin</i> is re-deposited : chlorine and hypchlorates destroy its blue coord.<br>Crookes remarks on the insolubility of <i>Indigotin</i> as follows : |
| METHODS OF              | METHODS OF DYEING WITH INDIGO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DYEING.                 | COTTON VATS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                         | The above phenomena, vulgarly called "reduction," requires ${}^{\text{the h3}}_{f}$ and ${}^{transmithermitte$                                                                                                                               |

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| ^Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (G. Watt)                                                                                                                                                                       | 1NDIGOFERA<br>tinctoria.                           |
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| II. a [ Fe $(OH)_2$ ] Ferrous hydrate + 2 H <sub>2</sub> O<br>Ferric hydrate H- H« Hydrogen.<br>III. 2 $(C_8H_5NO)$ "Indigotin or blue-indigo + H                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                 | DIEING.                                            |
| NO) White-indigo.<br>The order in which the ingredients are generally<br>fill the vat with water and then to add first the grou<br>time, and after these have been stirred about wel<br>ferrous sulphate. The mixture is systematically ra<br>intervals for 24 hours.                                                                                                                                                                                                                         | und indigo and milk<br>l to add the solution<br>ked about at frequ                                                                                                              | x of<br>1 of<br>lent                               |
| The above process, while perhaps the most<br>•sometimes not followed, owing to the tendency of<br>To avoid this the ferrous sulphate and indigo ar<br>milk of lime afterwards, and gradually, as requi<br>to caustic soda, because cotton is found to dye<br>film of calcium carbonate that forms on the surface<br>its oxidation into <i>indigotin</i> . '1 he reduction into while<br>be complete when numerous thick dark-blue veins<br>the liquor and the surface has become covered with | f the fluid to thick<br>e first added, and<br>red. Lime is prefer<br>more rapidly and<br>e of the fluid preve<br>hite-indigo is known<br>appear on raking<br>a strong blue scun | the<br>red<br>the<br>ents<br>to<br>up<br>or        |
| •" flurry." The liquid should then be clear, and<br>colour; if greenish, undecomposed indigo is presen<br>phate should be added. If very dark, more lime is<br>The above is the usual vat preparation, but meta                                                                                                                                                                                                                                                                               | nt and more ferrous<br>s required.                                                                                                                                              | sul-                                               |
| to liberate the hydrogen :—<br>$Zn + H_3 O = Zn O = H_2.$                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                 |                                                    |
| The presence of lime and indigo are found to fa<br>tion, the liberated hydrogen reducing the indigo.<br>A hydro-sulphite vat may also be used :—                                                                                                                                                                                                                                                                                                                                              | -                                                                                                                                                                               | osi-                                               |
| $H_2 S9_3 + Zn = H_2 SO_2 + Zn$<br>Sulphurous acid + Zinc = Hypo-sulphurous aci                                                                                                                                                                                                                                                                                                                                                                                                               | 10<br>id + Zinc oxide.                                                                                                                                                          |                                                    |
| In practice Professor Hummel (Dyeing of T<br>zinc is usually allowed to act upon concentrated sol<br>gen sulphite (bisulphite) instead of sulphurous acid,<br>a solution of sodium hydrogen hyposulphite and zin<br>Zn + 3 Na H SO <sub>3</sub> = Na H SO <sub>2</sub> + Zn Na, (S<br>The reduction of the indigotin to white-indigo b<br>hyposulphite may be expressed thus :—                                                                                                               | <i>Textile Fabrics</i> ) says lution cf sodium hyde, there being product sodium sulphite : $O_3$ )2 + $H_2$ O.                                                                  | lro-<br>liced<br>—                                 |
| 2(C <sub>8</sub> H, NO) + m NaHSO <sub>2</sub><br>Indigotin Acid Sodium hyposulphite<br>2(C <sub>fl</sub> H <sub>8</sub> NO) + Na <sub>2</sub> SO <sub>3</sub><br>White-indigo Disodium sulphi                                                                                                                                                                                                                                                                                                | + Na HO =<br>Cau. <sup>c</sup> tic soda                                                                                                                                         |                                                    |
| The hyposulphite is a somewhat difficult process<br>solution of reduced indigo may be obtained whice<br>charging or replenishing a dye-vat. It should be us<br>hot for wool. It is a useful vat for silk-dyeing.                                                                                                                                                                                                                                                                              | ch can be employed                                                                                                                                                              | for                                                |
| INDIGO EXTRACT, OR SAXONY E<br>The above three processes are those generally us<br>as remarked, the hyposulphite may also be empl<br>Instead of the vat process, however, animal fibre<br>often dyed with what is called INDIGO-EXTRACT or<br>the action of strong sulphuric acid <i>indigotin</i> is conv<br><i>gotin-disvlphonic</i> acid. The indigo in this prepara<br>complete a change that it cannot be restored. The<br>thus obtained have no affinity for cotton, though             | sed with cotton, thou<br>loyed with wool or<br>es—wool, silk, &c—<br>INDIGO-CARMINE.<br>verted into soluble <i>i</i><br>ation has undergon<br>ne derivatives of inc             | silk.<br>-are<br>By<br><i>ndi-</i><br>e so<br>digo |
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| INDIGOFE                                         | Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>ÆTHODS OF</b><br>DYEING.<br>axony Blue.       | tinting. The colours are fugitive, but their ease of application is a great recommendation, and animal fibres may be dyed on being simply steeped in the slightly acidulated hot extract solution. The colour is much brighter than can be obtained from a vat-dye, but it does not stand milling. Silk to be dyed with the extract is sometimes mordanted with alum, in order, on the addition of cochineal, logwood, or orchil, to produce reddish shades—purples or violets. Indigo-carmine is produced by the addition of sodium sulphate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| ermentation.                                     | FERMENTATION VATS FOR WOOLLEN AND SILK Goods*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Vats for<br>Woollens<br>and Silks.<br><b>311</b> | Indigotin is also applied to woollen goods by means of a vat contdirt-<br>ing a special preparation of white-indigo. These vats are prepared of<br>"set" in various ways, but in all, the indigo is reduced in the presence, ot<br>some organic substance such as woad, madder, molasses, bran, &c. Ane<br>organic material undergoes fermentation when macerated in water with<br>the application of heat. The hydrogen evolved by the fermentation<br>transforms the <i>indigotin</i> , and this is dissolved in the vat by the addition<br>of some alkali or alkaline carbonate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Woad Vat.<br>312                                 | The Woad Vat—The woad plant itself, formerly employed as a source of<br>blue, is now used entirely as a fermentation agent in the woollen vat, but it<br>is probable that cabbage leaves might be equally serviceable. The vat is<br>first partly filled with water, and crushed woad is then added, the whole<br>being well stirred and the temperature raised to $50^{\circ}$ or $60^{\circ}$ C. This <sup>tem</sup> j*j <sup>ra</sup> j<br>ture is maintained from 24 to 30 hours; bran and madder are now added<br>and half the total required quantity of lime. After being well stirred, the vat<br>9 covered over and left for 12 to 24 hours. By this time fermentation na <sup>5</sup><br>been established, the surface of the fluid becomes covered with a coppery-W <sup>u</sup> e<br>scum, and on being stirred the liquor is seen to be of a greenish yellow <sup>coro</sup> ? 6<br>interspersed with blue veins of restored indigo. If the bottom of the vat D<br>disturbed a froth will appear on the surface, and the sediment, if brougnt<br>up, will smell sour. A piece of wool dipped in the bath and then ex-<br>posed to the air is coloured blue. All these indications denote the favour-<br>able progression of fermentation, and it now becomes necessary to JI/AJf<br>the further stages under control. The remainder of the lime is <sup>adde</sup> T<br>by degrees, vigorously stirring the contents of the vat all the while. <sup>1</sup> Y<br>the course of 24. hours if the fermentation is checked by the addition of<br>lime, or if too slow it is accelerated by the addition of bran. The dyeing<br>power of the vat is maintained by the daily addition of bran. The dyeing<br>power of the vat is maintained by the daily addition of bran ana<br>every other day of indigo. After three or foir months, or when the vat<br>sediment becomes bulky, no further additions are made, but the vat is used<br>for lighter shades until its indigo is exhausted, when it has to be emptied<br>out and a fresh vat started.<br>The above account of a fermentation-vat has been compiled from<br>Professor Hummel's excellent work on the subject, and for fuller details |
| Potash Vat.<br>313<br>Soda Vat.                  | and quantities of the ingredients the reader is referred to the original text.<br><i>The Potash Vat</i> , which contains indigo, madder, bran, and carbonate ot<br>potash, is not so liable to get out of order owing to its not containing so<br>highly nitrogenous a substance as woad. It also dyes more rapidly and<br>gives deeper though duller shades of blue. The colour does not come oil<br>so much on milling with soap and weak alkalis. It is, therefore, best<br>adapted for very dark shades of navy blue and is better suited for silk-<br>dyeing than a vat containing lime. The best silk vat is, however, one in<br>which indigo is reduced by powdered zinc and ammonia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                  | The Soda, or German Vai contains indigo, bran (or treacle), carbonate of soda, and slaked lime.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 314                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Cbmmercial Indigo. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                              | OFERA<br>toria                        |
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| The Urine Vat is used by dyers who have to resort to vat dyeing or occasionally. It contains stale urine, and common salt, heated for seve hours up to $50^{\circ}$ or $60^{\circ}$ C. Madder is then added and indigo, fermentat being allowed to proceed as before until white-indigo is produced.                                                                                                                                                                                                                                                                                                                                                                                                                                             | nly ME<br>ral D                                                                                                                                              | THODS OF<br>YEING.<br>ine Vat.<br>315 |
| NATIVE VATS, OR THE PROCESSES of REDUCING INDIGO PURSUED<br>THE PEOPLE OP INDIA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | BY Na                                                                                                                                                        | tive Vats,<br>3l6                     |
| Though crude in comparison with the vats prepared in Europe,<br>native dyers of India are fully aware of most of the processes of render<br>indigo soluble, and in fixing it by making it again insoluble within<br>tissue of the fabric. The vat most generally preferred, however, is a<br>mentation-vat. A pound of powdered indigo is soaked with three pour<br>of lirne and four pounds of impure carbonate of soda in water; four our<br>of sugar are added. If fermentation does not commence in seven or ei-<br>hours, more lime and sugar are added, and if the weather be cold the<br>is heated to encourage the fermentation. When the reduction has tal<br>place the vat is used in the ordinary manner ( <i>Buck, Dyes and Tans</i> | ing<br>the<br>fer-<br>nds<br>ces<br>ght <sup>1</sup><br>vat<br>ken                                                                                           | ·                                     |
| North-Western Provinces),<br>In the Nasik Gazetteer an interesting account of indigo-dyeing,<br>practised in Bombay, will be found. "To prepare the solution of ind<br>the dyers have two vats—a salt vat, <i>khdra pip</i> , for dyeing cotton, in wh<br>poor indigo, and a sweet vat, <i>mitha pip</i> , for silk, in which good indigo<br>used." The vat employed is an open-topped wooden barrel or eart<br>vessel sunk in the ground, and large enough to hold 300 gallons of wat                                                                                                                                                                                                                                                           | ligo<br>lich<br>), is<br>hen                                                                                                                                 |                                       |
| The Salt F <atfabout 150="" are="" gallons="" into="" of="" td="" the="" thrown="" vat.<="" water=""><td>To<br/>The<br/>ligo<br/>o is<br/>and<br/>and<br/>ght-<br/>nird<br/>nird<br/>ent<br/>ture<br/>edi-<br/>are<br/>into<br/>the<br/>The<br/>Cully<br/>seful<br/>be<br/>nate<br/>t 48)</td><td>Salt Vat.<br/>317</td></atfabout>                                                                                                                                                                                                                                                                                                                                                                                                              | To<br>The<br>ligo<br>o is<br>and<br>and<br>ght-<br>nird<br>nird<br>ent<br>ture<br>edi-<br>are<br>into<br>the<br>The<br>Cully<br>seful<br>be<br>nate<br>t 48) | Salt Vat.<br>317                      |
| The Sweet Vat.—For this purpose 120 gallons of water should be pla<br>in the barrel, 4ft carbonate of soda added, and the vat kept covered<br>three days. On the third day 4R) carbonate of soda and 2ft of<br>should be added, and the mixture stirred three times a day. Next me<br>ing, the fourth day, 4th of old brown sugar are dissolved in cold wa<br>the solution is thrown into the vat and the mixture stirred occas<br>ally for three days more. When fermentation sets in the mixture be<br>to crackle. At this stage the foam is examined, and, if it is redo<br>the vat is ready. If white carbonate of soda and lime have to be add                                                                                              | for<br>lime<br>orn-<br>ater,<br>ion-<br>gins<br>lish                                                                                                         | weet Vat,<br>318                      |

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| INDIGOFER<br>tinctoria.                            | A Commercial Indigo.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| METHODS OF<br>DYEING.<br>Sweet Vat.                | be not attended to the indigo rots, has an offensive smell, and is unfit fo<br>dyeing ( <i>Dr. Ndray an Daji, Dyeing in Western India, 23</i> ).<br>In Bengal sugar is used in only one or two districts as the fermenta-<br>tion agent. In Darjeeling the refuse water obtained in washing sheep<br>is employed in the vat. In Rajshahi district the twigs of Monnda<br>tinctoria are added to the vat, apparently much after the same manner ar-<br>madder is employed in Europe. In Malda the seeds of Cassia Tora are<br>added to the vat. This subject has been alluded to above in connection<br>with the manufacture of Indigo in South India and is apparently of much<br>interest, since the employment of these seeds is so widely known. For a<br>similar purpose apparently the seeds of a plant known as <i>icht-bicht</i> are<br>used in Chittagong ( <i>Dr. McCann, Dyes and Tans of Bengal</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Indigo-Dyeing!<br>and Calico-I<br>Printing.<br>319 | INDIGO-DYEING AND CALICO-PRINTING.<br>The principle of indigo-dyeing has been indicated by the foregoing<br>remarks regarding the chemistry of the drug, and the formation of dye-vats<br>The fabric or yarn is immersed in the reduced indigo solution for the required<br>with a sufficient amount of white-indigo. Care must be taken not to bring<br>the fabric or yarn above the surface of the vat when " hawking" it in the<br>fluid, nor of course should it be allowed to touch the sediment. If raised<br>above the surface, it will be at once oxidised and the portions so acted upon<br>will receive a different colour from the rest. Cloth dyes best in a vat in<br>which moderate fermentation is preserved. After the necessary degree of<br>immersion the fabric is hung up to drain, and is thereby exposed to the a in<br>when the oxygen combines with the excess hydrogen to form water, and<br>this evaporates away, leaving the insoluble particles of <i>indigotin</i> in <i>i</i> be<br>interior of each filament of the texture. If the exact shade has not be<br>obtained the process is repeated. The greatest difficulty is in 'egulating<br>the fermentation bath, and considerable experience is required to know<br>when it is right. Woollen materials should be first boiled well in 2007<br>purpose of allowing the damp fabric to dye evenly and prevents the ad-<br>mission into the vat of too much air which would oxidise the indigo-write,<br>Before beginning to dye, the blue scum should be taken off the surface off<br>the liquor of the vst; otherwise spots will be given to the parts of the tex-<br>ture coming first in contact. After dyeing, the fabric should be rinsed in<br>acidulated water and washed thoroughly. In order to remove every <sup>1</sup> A for the<br>fabric should be boiled in a solution of alum or bichromate of potash and<br>tartaric acid. Some dyers also regard a boiling of the dyed £° ds JL<br>barwood, sanderswood, or camwood as necessary to completely fix the<br>fabric should be boiled in a solution of alum or bichromate of potash and<br>tartaric acid. Some dyers also regard a boiling of the dyed £° ds JL<br>barwood, sanderswood, |

printing or pencilling white-indigo upon the surface. The\* alkali employed to hold the dye in solution is washed out as soon as the *indigogen* has been absorbed by the tissue and the oxidation produced by washing trans-

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| forms the dye into its insoluble form, thus exhibiting the patterns printed.<br>"Fast-blue" prints are obtained by precipitating from a paste of indigo<br>and a strong reducing metallic oxide (commonly hydrated protoxide of<br>tin), a too rapid oxidation of the white-indigo being prevented. The paste<br>is printed on the fabric which is then passed through an alkali bath of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | METHODS OF<br>DYEING.<br>Indigo-dyeing<br>and Calico-<br>Printing. |
| lime-water or soda solution. The alkali replaces the oxide of tin, forming<br>a soluble combination of white-indigo, which penetrates and is fixed by<br>oxidation. "China-blue "* prints are somewhat similar. Indigo previously<br>pulverised is printed on the tissue and the fabric placed under the influence<br>of reducing agents; when absorbed the white-indigo is oxidised. But<br>parti-coloured goods may be produced having a blue ground colour by<br>either of two processes technically known as <i>resist</i> and <i>discharge</i> . In the<br>fornyir the fabric, prior to immersion in the indigo vat, is printed with a<br>substance which, either chemically or mechanically, prevents the <i>mdigogen</i><br>penetrating into the fabric. After being dyed blue on the exposed parts<br>the <i>resist</i> is washed off and the white patches printed with any other<br>colours or patterns. In the latter process ( <i>discharge</i> ) the <i>indigotin</i> of the<br>uniformly dyed fabric is removed by chemical agents which are printed<br>in the desired pattern. The mechanical <i>resists</i> , generally used, are wax<br>or pipe-clay (much after the manner in which the <i>Palamput</i> calicoes of<br>South India are dyed) and the chemical <i>resists</i> are powerfully oxidising<br>agents, such as salts of copper or bichloride of mercury, which convert the<br><i>indigogen</i> of the vat, coming in contact with the printed portions, into | Resists.<br>320                                                    |
| <i>indigotin</i> which is deposited mechanically on the surface, instead of being<br>absorbed into the substance of the fabric. <i>Resists</i> printed on a blue<br>ground and the fabric again plunged into the vat results in a pattern in<br>shades of blue. The <i>discharges</i> are in many respects inconvenient, as they<br>do not give sharp prints and very strong vats are required to prevent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Discharges.                                                        |
| running. Chromic acid is the best discharge, but chromate of lead is often<br>used. Red prussiate of potash and caustic soda also form a useful dis-<br>charge to indigo.<br><i>Defects.</i> —All fermentation-vats are subject to derangements by which                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Defects.                                                           |
| <i>Depects.</i> —An termentation-vats are subject to derangements by which<br>they become more or less useless. Deficiency of lime is the most common<br>cause, the fermentation being thus unchecked and allowed to proceed<br>until the liquor is useless. This may be recognised by the scum disap-<br>pearing, the liquor becoming muddy, and the escape of a disagreeable<br>odour. The only remedy is to heat the vat to 0,0°C and add lime. If<br>this does not check the fermentation the preparation is useless. Another<br>danger, according to Professor Hummel, is too rapid working of the vat.<br>The colours become faint and the liquor gives off an ammoniacal odour.<br>The third defect is too much lime. The indigo-white is precipitated and<br>the liquor becomes of a dark-brown colour, while the healthy odour and<br>the scum disappear. If noticed in time this may be corrected by the addi-<br>tion of a little ferrous sulphate or dilute sulphuric acid to precipitate the<br>lime in an insoluble condition.                                                                                                                                                                                                                                                                                                                                                                                                                                             | 322                                                                |
| TRADE IN INDIGO.<br>It is perhaps unnecessary to endeavour to carry the modern trade in<br>Indigo further back than one hundred years. The total imports into                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                    |

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It is perhaps unnecessary to endeavour to carry the modern trade in Indigo further back than one hundred years. The total imports into Great Britain were, in 1782, 495,100ft, of which the States of America furnished 161,216; the West Indies 64,309; British Continental Colonies 128,640; Flanders (Austrian) 78,070; Portugal 27,308; Asia 25,535 (including, of course, India); Ireland 6,373, and Spain 200ft. In the year following, the imports were 1,284,565ft, Asia contributing 93,047; the States of America 518,980; the West Indies 204,645, and 117,235ft from Holland. From that year the British imports steadily increased

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| IND1G0FER<br>tinctoria                                          | L'ommerciel Indido                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TRADE.<br>Restoration<br>of Indigo<br>Trade to<br>India.<br>324 | till 1788, they attained the magnitude of 2,096,91 lib, of which Asia furnished 622,691ft; the States of America 1,060,164; Spain 204,461, and the West Indies 94,550ft. In 1795 they amounted to 4,368,027ft, of which Bengal furnished 2,955,862ft. In a Despatch, dated 1792, the Board of Directors congratulated the Indian Government, that, as the British imports of Bengal Indigo increased, those from the Spanish and French colonies declined, while at the same time a large export trade from Great Britain to the Continent had been established. In 1790 the're-export trade amounted to close on a million pounds of the dye.<br>It may thus be said that in less than 20 years, from the date of their first effort, the East India Company, by the enlightened action they took, completely restored to India its indigo industry. It is also noteworthy that whereas the total imports of indigo into Great Britain were in 1782 lees thart half a million pounds, the production of a superior quality at a cheap rate, in Bengal, had so increased the demand that ten years later Great Britain alone received over four million pounds. This brilliant result is fully borne out by the statistics of the present indigo trade. The French and Spanish manufacturers have practically ceased to exist. In 1888 the United States of America furnished Great Britain with 123 cwt.; Central America with 6,769 cwt., and Holland gave to England a small amount, derived most probably from Java mainly. With the single Dutch exception, however, the other European nations that are annually shown as participating in the British supply may be viewed as re-exporting Indian Indigo* Practically nine-tenths of the Indigo trade is now Indian. Thus, for example, out of a total of 78,128 cwt. (8,750,336ft) of indigo, imported by Great Britain last year (1888), India furnished 69,416 cwt. The Philipp <sup>1</sup> TM <sup>6</sup> } |
| •                                                               | expand. It is doubtful how far any other country (except perhaps<br>China) could ever compete with India. We possess a complete $m \circ n \circ $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Commercial Indigo. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INDIGOFERA<br>tinctoria.                                                                                                                                                                                                                                                                                                                            |
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| months, vis., November to February; though it is lessened by the that the whole of the indigo intended for the foreign markets has left I by the end of March. The foreign transactions of each official year would seriously overlap the commercial. most important error, however, lies in the fact of Government figures b the gross weight of cases containing indigo, while the commercial are for weights of actual indigo. It would, in fact, be a safer mode of comparit therefore, to take the Government gross maund of 82ft as correspond to the commercial and the commercial are tweight in factory maunds of 74ftc—the differ being the weight of packages, &c, but merchants put down the differ in the two returns as equal to 25 per cent. While bearing in mind t sources of error, an average of several years would give a fairly trustwo mode of estimation, more so at all events than the actual figures for indigo trade of any one year. In 1813 Milburn stated that the European demand for indigo amo ed to three million pounds, but that, if required, Bengal alone might fur five times that amount. It is somewhat significant that the Indian duction is today a little over its prophesied possibilities. The aver annual exports of indigo from all India during the past ten years H been 134,798 cwt. (15,097,3761b). According to Messrs. Thomas & do not take into consideration. These sources of supply increase slig the returns for Bengal, but there exists a sufficient correspondence in commercial and official statistics to confirm the accuracy of both. According to the official returns of Bengal the production <i>flue</i> sets in the same time exports, whether by land or see, have averaged 9,460,8781b, thus leavin balance of 396,8571b in stock or available for local consumption. It se probable that the Bengal local consumption averages from 230,000 $400,0001b$ annually. A similar analysis might be worked out for Mad but it is believed the figures of trade in the four tables here given will diver a sufficiently comprehensive idea of the Indian indu | ndia<br>puld,<br>rnal<br>The<br>eing<br>rnet<br>son,<br>ding<br>ence<br>ence<br>hese<br>rthy<br>the<br>unt-<br>nish<br>pro-<br>rage<br>nave<br>o.'s<br>past<br>oab<br>hree<br>t of<br>tral<br>Co.<br>htly<br>the<br>ord-<br>nave<br>all<br>ng a<br>ems<br>6 to<br>ras,<br>con-<br>nay,<br>the<br>pro-<br>lass<br>d a<br>s of<br>ngly<br>nds<br>e on |
| (,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                     |

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(Con/, with remarks under the Chapter on "YIELD AND AREA UNDER' INDIGO.")

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| TABLE | NO. | I. |
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The following table gives the production of Indigo for the past ten years as recorded by the Calcutta Merchants (compiled from Messrs\* Thomas & Co.'s Annual Statement of "Averages"). The figures are those of net weights in maunds of

|                   |       |       | YEA  | AR.  |     |   |     |           | Lower Bengal. | Behar, <i>i.e.</i> ,<br>Tirhút,<br>Champaran.<br>Chuprah, &c. | Benares, <i>i.e.,</i><br>Goruckpore,<br>Shahabad, Jaun-<br>pore, Allahabad, | Doab.     | Total in Factory<br>Maunds of 74ft<br>10 oz. | Total in ft.    |            |
|-------------------|-------|-------|------|------|-----|---|-----|-----------|---------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|-----------|----------------------------------------------|-----------------|------------|
| 1879              | •     | •     |      | •    | •   |   | •   | •         | 14,535        | 28,387                                                        | 8,696                                                                       | 21,510    | 73,128                                       | 5,457,'77       |            |
| 1880              |       | •     | •    | •    |     | • | *   | •         | 23,490        | 66,390                                                        | 10,830                                                                      | 35,490    | 136,200                                      | 10,163,925      |            |
| 1881              |       | •     | •    | •    |     | • | •   | •         | I7»425        | 58,062                                                        | 14,484                                                                      | 45,434    | 135,405                                      | 10,104,598      | _          |
| 18\$2             |       | •     | •    | •    |     | • | •   | •         | i8,957        | 58,569                                                        | i5,7io                                                                      | 57,042    | 150,278                                      | 11,214,495      | r          |
| 1883              |       | •     | •    | •    |     | • | •   | •         | 17,206        | 58,748                                                        | 18,648                                                                      | 64,786    | 159,388                                      | 11,894,329      | Domercian  |
| 1804              |       | •     | •    | •    |     | • | •   | •         | 19,668        | 62,038                                                        | 25*141                                                                      | 59,660    | 166,507                                      | 12,425,584      | 1 2        |
| 1885              |       | •     | •    | •    |     | • | •   | •         | 19,829        | 51,887                                                        | 13,450                                                                      | 23,526    | 108,692                                      | 8,111,140       |            |
| 886               |       | •     | •    | •    |     | • | •   | •         | 23,353        | 66,080                                                        | 11,574                                                                      | 30,254    | 131,261                                      | 9,795,352       |            |
| 887               |       | •     | •    | •    |     | • | •   | •         | 21,700        | 67,800                                                        | 14,750                                                                      | 27,250    | 131,500                                      | 9,813,187       | naigo.     |
| 1888              |       | •     | •    | •    |     | • | •   | •         | 22,780        | 69,585                                                        | 12,265                                                                      | 27,120    | 131,750                                      | 9,831,843       | ן <b>פ</b> |
| verage            |       |       |      |      |     |   | ls. | •         | 19,894        | 58,754                                                        | 14,554                                                                      | 39,207    | 132,409                                      | 9,881,021       | ł          |
| each o            | of al | DOV   | e ye | ars, |     | Y |     | •         | 1,484,590     | 4,384,517                                                     | 1,086,092                                                                   | 2,925,822 | <br>Averages for all<br>the Provinces        | Average per 1b. |            |
| Highest<br>years  | per   | · fac | tory | y ma | aun | d | •   | R         | 289-12        | 263-14                                                        | 233-2                                                                       | 227-2     | here dealt with.<br>253-7                    | 3-5-9           |            |
| Lowest<br>years   | per   | · fac | ctor | y ma | aun | d | •   | R         | j 197-2       | 192-8                                                         | 173-3                                                                       | 180-4     | 185-12                                       | 2-7-0           |            |
| Average<br>ince p |       |       |      |      |     |   |     | rov-<br>R |               | 234-2                                                         | 214-0                                                                       | 195-0     | 220-0                                        | 2-150           |            |

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TABLE NO. II.

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Analysis of Bengal Trade in Indigo during the past three years derived from all available Official Returns—the maunds being mostly (though not invariably) gross weight of 82 ft.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | IMPO                                                                                                                | RTS AND PRODU                                                                                                             | UCTION.                                                                                                                                      | EXPORTS AND CONSUMPTION.                                                                            |                                                                                                                     |                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| ROUTES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1885-86.                                                                                                            | 1886-87.                                                                                                                  | 1887-88.                                                                                                                                     | 1885-86.                                                                                            | 1886-87.                                                                                                            | 1887-88.                                                                                                          |
| 1. By East Indian Railway       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .< | 00,833<br>7,448,306<br>9,642<br><b>79</b> 9,344<br><br>3*773<br>260,186<br>21<br>1,722<br>258<br>28,596<br>8<br>896 | $\begin{array}{c} \begin{array}{c} 1,13.767\\ 9,328,894\\ 8,958\\ 734,556\\ 461\\ 37,802\\ 1,878\\ 153,996\\ \end{array}$ | 1,13,638<br>9,3 <sup>1</sup> 86 1<br>11,646<br>954,972<br>515<br>42,230<br>3,900<br>319,800<br><br>839<br>93,968<br>0 <sup>75</sup><br>8,400 | 855<br>70,110<br>21<br>1,722<br><br><b>138</b><br>11,316<br><br>135<br>15W20<br>76,109<br>8,524,208 | 196<br>16,072<br>177<br>14,514<br>16<br><b>1,312</b><br>232<br>19,024<br><br><br>25<br>2,800<br>87,941<br>9,849,392 | 447<br>36,654<br>338<br>27,716<br>16<br>1,312<br>90<br><b>7,380</b><br><br><br>22<br>2,464<br>87,335<br>9,781,520 |
| Total ft                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | • 8,530,350                                                                                                         | 10,305,200                                                                                                                | 10,737,686                                                                                                                                   | 8,622,476                                                                                           | 9,9O3,H4                                                                                                            | 9,857,046                                                                                                         |
| • Balance over exports left in Bengal • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | •                                                                                                                   | 402/386 ft                                                                                                                | 880,640 ft                                                                                                                                   | •<br>Exports ex-<br>ceeded the im-<br>ports by<br>92,126 ft<br>thus drawing<br>on old stocks.       |                                                                                                                     |                                                                                                                   |

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| NDIGOFER.<br>_tinctoria_ | A<br>•                                                                                                                                                                                                                                                                                                                                                                                                                                             | Comme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | rcial Indig                                                                                                                                                                                                                                  | <b>30.</b>                                                                                                                                                                                                    |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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| TRADE.                   | In the Bengal Repo<br>and Road) it is stated to<br>Calcutta derived its indig                                                                                                                                                                                                                                                                                                                                                                      | that the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 87-88 on th<br>following                                                                                                                                                                                                                     | e Internal<br>were the                                                                                                                                                                                        | Trade (R<br>sources fi                                                                                                                                                                                                                  | iver, Rai<br>om wtto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                          | Behar • •<br>North-West Pro<br>and Oudh.                                                                                                                                                                                                                                                                                                                                                                                                           | . •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1885-86.<br>Maunds.<br>59,48i<br>30,580                                                                                                                                                                                                      | 1886-87.<br>Maunds.<br>73.798<br>39,194                                                                                                                                                                       | 1887*88.<br>Maunds.<br>71,457<br>40,^22                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          | Bengal . '<br>Other places                                                                                                                                                                                                                                                                                                                                                                                                                         | •••                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13,423<br>546                                                                                                                                                                                                                                | 11,871<br>808                                                                                                                                                                                                 | 16,664<br>2,396                                                                                                                                                                                                                         | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                          | • TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                            | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1,04,030                                                                                                                                                                                                                                     | 1,25,671                                                                                                                                                                                                      | i,30,939                                                                                                                                                                                                                                | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                          | the customs return the pi<br>R219 per maund in the pi<br>obtained in Calcutta in<br>reduced by increased co<br>regard to the North-We                                                                                                                                                                                                                                                                                                              | previous y<br>consequ<br>onsumptionst the constant of the constant o | vear. It is<br>ence of sto<br>on in Eur<br>cultivation                                                                                                                                                                                       | stated that<br>ocks in Lo<br>ope and<br>was cons                                                                                                                                                              | at higher p<br>ondon hav<br>America.'<br>iderably i                                                                                                                                                                                     | rices we<br>ving &£                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                          | R219 per maund in the p<br>obtained in Calcutta in<br>reduced by increased co                                                                                                                                                                                                                                                                                                                                                                      | previous y<br>conseque<br>onsumption<br>est, the of<br>the is said<br>where the<br>preceding<br>anufacture<br>year. The<br>evious year<br>of District<br>The Indig<br>tha Divis<br>a certain<br>and Recorr<br>rnishes t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | vear. It is<br>ence of ste<br>on in Eur<br>cultivation<br>I to have<br>ne outturn<br>g year wer<br>red was 2<br>he price va<br>ear it vario<br>amounted<br>go industr<br>sion; but i<br>extent by<br>ds and A<br>he followin<br>s during the | stated tha<br>ocks in La<br>ope and<br>was cons<br>been very<br>is shown to<br>e Jessore a<br>2,762 mau<br>rried from R<br>to 1,165 n<br>y is said ta<br>n the Bha<br>bad distril<br>griculture<br>ng informa | at higher p<br>ondon hay<br>America.'<br>iderably r<br>poor. A<br>to have be<br>and Rajsh<br>ands, agai<br>R190 to R<br>maunds, agai<br>sulpo to R<br>maunds, agai<br>o be increa<br>gulpore D<br>bution of r<br>of the N<br>ation rega | rices we<br>ving &<br>ving &<br>ving &<br>ving &<br>ving &<br>ving the<br>ving ving the<br>ving ving the<br>ving the<br>ving ving the<br>vi |
|                          | R219 per maund in the p<br>obtained in Calcutta in<br>reduced by increased cor<br>regard to the North-Wo<br>last year, but the produ<br>Bengal, the only districts<br>ciably more than in the<br>Jessore the quantity m<br>maunds in the'' previous<br>maund, while in the pre-<br>outturn in the Rajshahye<br>maunds in 1886-87.'' '''<br>doing very well in the Pa<br>season's crop suffered to<br>The Director of Lar<br>Provinces and Oudh fur | previous y<br>conseque<br>onsumption<br>est, the of<br>the is said<br>where the<br>preceding<br>anufacture<br>year. The<br>evious year<br>constructs<br>The Indigation<br>of Recorn<br>rnishes the<br>provinces                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | vear. It is<br>ence of ste<br>on in Eur<br>cultivation<br>I to have<br>ne outturn<br>g year wer<br>red was 2<br>he price va<br>ear it vario<br>amounted<br>go industr<br>sion; but i<br>extent by<br>rds and A<br>he followin                | stated tha<br>ocks in La<br>ope and<br>was cons<br>been very<br>is shown to<br>e Jessore a<br>2,762 mau<br>rried from R<br>to 1,165 n<br>y is said ta<br>n the Bha<br>bad distril<br>griculture<br>ng informa | at higher p<br>ondon hay<br>America.'<br>iderably r<br>poor. A<br>to have be<br>and Rajsh<br>ands, agai<br>R190 to R<br>maunds, agai<br>suppore D<br>bution of r<br>of the N<br>ation rega<br>e years:*                                 | rices we<br>ving &<br>ving &<br>ving &<br>ving &<br>ving &<br>view of the<br>vision the<br>rain.<br>orth-we<br>urding the<br>vision the                                                                   |

In the following table the exports from India are given, Bengal  $m^* J_{21}^{2}$ thus including the above quantities from the North-West Provinces as we as smaller amounts from the Panjdb, Central Provinces, and Assam, Taking the returns of Foreign exports as approximately representing tn Bengal trade, on an average Bengal itself contributes 6,500,000B, *sua* the North-West Provinces 3,200,000fc, the balance being derived from «re other provinces named above.

|        |                  | 1878-79.*   | i879-80.»   | 1880-81.    | 1881-82.    | 188Z-83.    | 1883-84.    | 1884-85.    | 1885-86.    | 1886-87.    | 1887-88.    | Averagfe of ten years. |
|--------|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------------|
|        | f <sup>B</sup>   | 2,30,88,814 | 1,88,04,499 | 2,88,45.753 | 3,15,12,595 | 3,02,35.399 | 3,37»3i.8lo | 3.02,33457  | 2,55*96,913 | 2,62,43.170 | 2,74,56,889 | 2,75,74,980            |
| BBNGAL | . • <b>C</b> wt. | 74*747      | 47,928      | 88,111      | 91,898      | 99.715      | 110,015     | 106,069     | 76,109      | 87,041      | 87,335      | 86,987                 |
|        | <b>I</b> »       | 8,371*664   |             |             | 10,292,576  |             |             |             | 8,524,208   | 9,849,392   | 9,781,520   | 9,742,521              |
|        | 1 <sup>R</sup>   | 59,19,466   | 94,33,527   | 62,35.270   | 1,22,78,358 | 76,30,967   | Ifi5,35,i34 | 94,35,208   | 1,03,61,412 | 86,40,177   | 97,39,620   | 91,20,914              |
| MADRAS | . « Cwt.         | 26,111      | 43,899      | 25,295      | 51,088      | 33,474      | 51,724      | 42,001      | 45,828      | 38,314      | 42,812      | 40,054                 |
|        | 17 B             | 2,924,432   | 4,916,688   | 2,833,040   | 5,721,856   | 3,749,088   | 5,793,088   | 4,704,112   | 5,132,736   | 4,291,168   | 4,794,944   | 4,486,115              |
|        | ( <sup>r R</sup> | 3,45,583    | 8,12,788    | 4,15,981    | 8,53,3"     | 7,71,503    | 7,62,110    | 6,34,295    | 15,75,039   | 15,88,247   | 13,58,984   | 9,11,784               |
| BOMBAY | • < Cwt.         | 2,229       | 5*331       | 2,954       | 4,507       | 4.504       | 4,006       | 3.376       | 8,015       | 8,319       | 6,494       | 4,874                  |
|        | L ft             | 249,648     | 597*072     | 218,848     | 504,784     | 504,448     | 448,672     | 378,112     | 897,680     | 931,728     | 727,328     | 545,832                |
|        | A R              | 2,50,762    | 4,21,451    | 2,18,810    | 4,46,537    | 4.92,101    | 3,80,818    | 3.85.536    | 2.98,237    | 4,45,175    | 3,51,001    | 3,69,043               |
| SIND   | 'Cwt.            | 1,964       | 3*765       | i,5io       | 2,870       | 3,348       | 2,845       | 3.183       | 2,543       | 3,822       | 3,003       | 2,885                  |
|        | il »             | 219,968     | 421,680     | 169,120     | 321,440     | 374,976     | 318,640     | 356,496     | 284,816     | 428,064     | 336,336     | 323,154                |
|        | (R               |             | •••         | •••         | ***         | •••         |             | •••         | ***         | •••         |             | 3                      |
| BURMA  | • « Cwt.         |             | •••         | •••         |             | •••         | ***         |             |             |             | • •••       | ***                    |
|        | ľ                |             | ***         | ***         | •••         | •••         |             |             | 545         |             | ***         | ***                    |
|        | r R              | 2,96,04,625 | 2,94,72,265 | 3,57,i5,8i4 | 4,50,90,802 | 3,91,29,970 | 4,64,09,906 | 4,06,88,996 | 3,78,3«,60i | 3,69,16,769 | 3*89.06,494 | 3,79,76,724            |
| TOTAL  | •< Cwt.          | 105,051     | 100,923     | 116,870     | 150,363     | 141,041     | 168,590     | 154.629     | 132,495     | 138,396     | 139,644     | 134,800                |
|        | li Jh            | 11,765,712  | u.303.376   | 13.089.440  | 16,840,656  | 15,796,592  | 18,882,080  | 17,318,448  | M.839.440   | 15,500,352  | 15,640,128  | 15,097,622             |

TABLE NO. III.—Foreign Exports of Indigo from India during the fiast ten years\*

\* These were famine years.

Products of to 'a.

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5

TRADE.

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| ADE.            |                                                                                                                                                                                                             |                                                                                                                                                             | nmercial                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  |                                                                                                                                     |                                                                                                                                                                                                                                                              |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | The following                                                                                                                                                                                               | analysis <i>(</i>                                                                                                                                           | of the For                                                                                                                                                                    | . IV.<br>eign Export                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ts of                                            | Indigo                                                                                                                              | from In*                                                                                                                                                                                                                                                     |
|                 | in 1887-88 exhibits                                                                                                                                                                                         | s the countr                                                                                                                                                | ies to whic                                                                                                                                                                   | consigned                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | i, ai                                            | nd in th                                                                                                                            | ne; P <sup>rei</sup> \                                                                                                                                                                                                                                       |
|                 | table will be found                                                                                                                                                                                         | the share of                                                                                                                                                | of these ex                                                                                                                                                                   | ports taken                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | by o                                             | each Pr                                                                                                                             | esidency/                                                                                                                                                                                                                                                    |
|                 | Count                                                                                                                                                                                                       | tries to which                                                                                                                                              | exported.                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | Cwt. 🔒                                                                                                                              | Value in<br>Rupees.                                                                                                                                                                                                                                          |
| 4               | United Kingdom                                                                                                                                                                                              |                                                                                                                                                             |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | 56,986                                                                                                                              | 1,54,34.982                                                                                                                                                                                                                                                  |
|                 | United Kingdom •<br>Austria •                                                                                                                                                                               | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <u> </u>                                         | 11,780<br>208                                                                                                                       | 35,                                                                                                                                                                                                                                                          |
|                 | Belgium • •<br>France •                                                                                                                                                                                     | • •                                                                                                                                                         | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ]                                                | 208<br>17I4O <sup>6</sup>                                                                                                           | 49,76,9                                                                                                                                                                                                                                                      |
|                 | Germany •                                                                                                                                                                                                   | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1                                                | 6,3Q2                                                                                                                               | 38,857                                                                                                                                                                                                                                                       |
|                 | Greece • •                                                                                                                                                                                                  | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | 145                                                                                                                                 | 4,                                                                                                                                                                                                                                                           |
| ! -             | Italy<br>Malta                                                                                                                                                                                              | • •                                                                                                                                                         | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | •                                                | 1,513<br>205                                                                                                                        |                                                                                                                                                                                                                                                              |
| i               | Russia                                                                                                                                                                                                      |                                                                                                                                                             | •••                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ł                                                | 1,668                                                                                                                               | 5,                                                                                                                                                                                                                                                           |
|                 | Turkey in Europe                                                                                                                                                                                            | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | í                                                | 222                                                                                                                                 | 29,49*42*                                                                                                                                                                                                                                                    |
| ł               | Egypt .<br>United States'                                                                                                                                                                                   | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | 13.154<br>21.350                                                                                                                    | 7.,3                                                                                                                                                                                                                                                         |
|                 | Aden • •                                                                                                                                                                                                    | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  | 21,350<br>18                                                                                                                        | 2,4                                                                                                                                                                                                                                                          |
|                 | Arabia • •<br>China—Hong-kong                                                                                                                                                                               | •••                                                                                                                                                         | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                  | 404<br>73                                                                                                                           |                                                                                                                                                                                                                                                              |
|                 | Persia .                                                                                                                                                                                                    | • •                                                                                                                                                         | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                  | 5,22 <u>9</u>                                                                                                                       | 7,9 <sup>8,</sup> S                                                                                                                                                                                                                                          |
|                 | Straits Settlements                                                                                                                                                                                         | • •                                                                                                                                                         | • •                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ļ                                                | 5                                                                                                                                   | - <b>58.833</b>                                                                                                                                                                                                                                              |
|                 | Turkey in Asia .<br>Australia                                                                                                                                                                               | • •                                                                                                                                                         | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ]                                                | 2,841<br>13                                                                                                                         | 3,500                                                                                                                                                                                                                                                        |
|                 | Other Countries                                                                                                                                                                                             |                                                                                                                                                             | • •                                                                                                                                                                           | • • •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                  | 12                                                                                                                                  |                                                                                                                                                                                                                                                              |
|                 |                                                                                                                                                                                                             |                                                                                                                                                             |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                  |                                                                                                                                     | 3,89,06,494                                                                                                                                                                                                                                                  |
|                 |                                                                                                                                                                                                             |                                                                                                                                                             |                                                                                                                                                                               | m o m / T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ι.                                               | 511                                                                                                                                 |                                                                                                                                                                                                                                                              |
|                 | <b></b>                                                                                                                                                                                                     |                                                                                                                                                             |                                                                                                                                                                               | TOTAL •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                                | 39,644                                                                                                                              | 3,09,0000                                                                                                                                                                                                                                                    |
|                 | The imports i<br>The following m<br>1887-88:—                                                                                                                                                               | nto India o                                                                                                                                                 | TABLE NO<br>f Foreign<br>en as an                                                                                                                                             | ). V.<br>Indigo are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | som                                              | newhat '                                                                                                                            | retn <b>ka</b> <sup>blC</sup>                                                                                                                                                                                                                                |
|                 | The following m                                                                                                                                                                                             | nto India o                                                                                                                                                 | f Foreign                                                                                                                                                                     | ). V.<br>Indigo are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | som<br>f tl                                      | newhat '                                                                                                                            | retn .?J <sup>ka<sup>blC</sup><br/>isact<sup>t</sup><br/>Value in</sup>                                                                                                                                                                                      |
|                 | The following m<br>1887-88:—<br>——————————————————————————————————                                                                                                                                          | nto India o<br>ay be giv                                                                                                                                    | f Foreign<br>en as an<br>Value in                                                                                                                                             | ). V.<br>Indigo are<br>analysis o                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | som<br>f tl                                      | newhat '<br>he tran<br><b>Cwt.</b>                                                                                                  | retn. ? J <sup>ns</sup> in<br>sact <sup>t</sup><br>Value in<br>Rupees.                                                                                                                                                                                       |
|                 | The following m<br>1887-88:                                                                                                                                                                                 | nto India o<br>ay be giv                                                                                                                                    | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438                                                                                                                        | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | som<br>f tl                                      | newhat '<br>he tran<br><b>Cwt.</b>                                                                                                  | ka <sup>blC</sup><br>retn. ? J <sup>nS</sup> in<br>sact <sup>l</sup><br>Value in<br>Rupees.<br>17,310<br>32,718                                                                                                                                              |
|                 | The following m<br>1887-88:                                                                                                                                                                                 | nto India o<br>ay be giv<br>Cwt.                                                                                                                            | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785                                                                                                              | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | som<br>f tl                                      | newhat '<br>he tran<br><b>Cwt.</b><br>75<br>76<br>68                                                                                | ka <sup>blC</sup><br>retn <sub>.</sub> ? J <sub>n</sub> s in<br>isact <sup>l</sup> ^ /<br>Value in<br>Rupees.<br>17,310<br>12,718<br>14,800                                                                                                                  |
|                 | The following m<br>1887-88:                                                                                                                                                                                 | conto India o<br>nay be giv<br>Cwt.                                                                                                                         | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438                                                                                                                        | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | som<br>f tl                                      | newhat '<br>he tran<br><b>Cwt.</b><br>75                                                                                            | retn. ? J nS in<br>sact <sup>1</sup><br>Value in<br>Rupees.<br>17,310<br>12,718<br>14,800<br>12,731                                                                                                                                                          |
|                 | The following m<br>1887-88:—<br>Exported from<br>United Kingdom<br>China—Hong-kong<br>Straits Settlements                                                                                                   | nto India o<br>ay be giv<br>Cwt.                                                                                                                            | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756                                                                                                    | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay .<br>Madras .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | som<br>f tl                                      | newhat '<br>he tran<br><b>Cwt.</b><br>75<br>76<br>68                                                                                | ka <sup>bi0</sup><br>teta .? J <sub>n</sub> s i:<br>sact <sup>i</sup><br>Value in<br>Rupees.<br>17,310<br>12,731<br>14,800<br>12,731                                                                                                                         |
|                 | The following m<br>1887-88:—<br>Exported from<br>United Kingdom<br>China—Hong-kong<br>Straits Settlements<br>Other Countries<br>TOTAL                                                                       | nto India o<br>ay be giv<br>Cwt.<br>143<br>72<br>1,259<br>4<br>1,478                                                                                        | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756<br>580<br>57,559                                                                                   | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay .<br>Madras .<br>Burma •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | som<br>of tl                                     | newhat '<br>ne tran<br><b>Cwt.</b><br>75<br>76<br>88<br>1,259<br>1,478                                                              | ka <sup>bi0</sup><br>sact <sup>i</sup> 2 J <sub>n</sub> s i<br>sact <sup>i</sup> ^ ^ /<br>Value in<br>Rupees.<br>17,310<br>12,718<br>14,800<br>12,73 <sup>1</sup><br>57,559                                                                                  |
|                 | The following m<br>1887-88:—<br>Exported from<br>United Kingdom<br>China—Hong-kong<br>Straits Settlements<br>Other Countries<br>TOTAL                                                                       | nto India o<br>ay be giv<br>Cwt.<br>143<br>72<br>1,259<br>4<br>1,478                                                                                        | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756<br>580<br>57,559                                                                                   | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay .<br>Madras .<br>Burma •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | som<br>of tl                                     | newhat '<br>ne tran<br><b>Cwt.</b><br>75<br>76<br>88<br>1,259<br>1,478                                                              | ka <sup>b1C</sup><br>retn. ?J <sub>ns</sub> in<br>isact <sup>l</sup><br>Value in<br>Rupees.<br>17,310<br>12,718<br>14,800<br>12,731<br>57,559                                                                                                                |
|                 | The following m<br>1887-88:—<br>Exported from<br>United Kingdom<br>China—Hong-kong<br>Straits Settlements<br>Other Countries                                                                                | nto India o<br>ay be giv<br>Cwt.<br>143<br>72<br>1,259<br>4<br>1,478<br>bly low-prid<br>a, where it                                                         | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756<br>580<br>57,559<br>red indigo<br>is largely                                                       | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay :<br>Madras :<br>Burma •<br>of the Strai<br>used by the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | som<br>f tl                                      | rewhat '<br>he tran<br>Cwt.<br>75<br>76<br>88<br>1,259<br>1,478<br>eems to t<br>ans for o                                           | retn. ? J <sup>R</sup> 8 <sup>b1C</sup><br>isact <sup>l</sup> ^ ^ ^<br>Value in<br>Rupees.<br>17,310<br>12,718<br>14,800<br>12,731<br>57,559<br>find a read                                                                                                  |
| ter-            | The following m<br>1887-88:—<br>Exported from<br>United Kingdom<br>China—Hong-kong<br>Straits Settlements<br>Other Countries<br>TOTAL<br>The remarkal<br>market in Burm<br>blue clothes, and<br>INTER-PROVI | nto India o<br>lay be giv<br>Cwt.<br>143<br>72<br>1,259<br>4<br>1,478<br>bly low-pric<br>a, where it<br>doubtless a                                         | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756<br>580<br>57,559<br>red indigo<br>is largely<br>also by the<br>TRANS-F                             | ). V.<br>Indigo are<br>analysis o<br>Imported t<br>Bengal<br>Bombay<br>Madras<br>Burma<br>of the Strai<br>used by the<br>Chinese res<br>RONTIER T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | som<br>f tl<br>oy<br>ts se<br>e Sha              | rewhat '<br>he tran<br><b>Cwt.</b><br>75<br>76<br>1,259<br>1,478<br>rems to r<br>ans for o<br>nts.<br>E IN IN                       | retn. ? J ns in         isact <sup>1</sup> ^ ^         Value in         Rupees.         17,310         12,718         14,800         12,718         14,800         12,718         14,731         57,559         find       a read         thei         DIGO. |
| ter-<br>Inclal. | The following m<br>1887-88:                                                                                                                                                                                 | nto India o<br>ay be giv<br>Cwt.<br>143<br>72<br>1,259<br>4<br>1,478<br>bly low-pric<br>a, where it<br>doubtless a<br>INCIAL ANE<br>II, given a<br>Calcutta | f Foreign<br>en as an<br>Value in<br>Rupees.<br>27,438<br>16,785<br>12,756<br>580<br>57,559<br>red indigo<br>is largely<br>also by the<br>TRANS-F<br>bove, will<br>the Indigo | <ul> <li>V.</li> <li>Indigo are analysis o</li> <li>Imported b</li> <li>Bengal .</li> <li>Bombay .</li> <li>Madras .</li> <li>Burma .</li> <li>Burma .</li> <li>of the Strai used by the chinese reserves</li> <li>RONTIER The found a construction of the second secon</li></ul> | som<br>f tl<br>y<br>ts se<br>Sha<br>sider<br>RAD | rewhat '<br>he tran<br><b>Cwt.</b><br>75<br>76<br>1,259<br>1,478<br>eems to to<br>ans for o<br>nts.<br>E IN IN<br>lance s<br>The co | retn. ? Jas i<br>sact'<br>Value in<br>Rupees.<br>17,310<br>12,731<br>57,559<br>find a read<br>dyeing<br>DIGO.<br>heet fc'r tl<br>astwi <sup>8</sup> ?                                                                                                        |

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| Commercial Indigo. (G. Wa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | tt.) INK.                                                                                                                                  |
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| 8,483 cwt., and Bengal 839 cwt. The coatwise EXPORTS during the speriod, were 9,584 cwt., valued at R 12,69,305. Of these exports Sind tributed 8,477 cwt., and Madras 1,038, the bulk of the former goin Bombay and of the latter to Bengal. The railway-borne trade she inter-provincial transactions of an even much larger amount than coast-wise. The total imports were 43,513 cwt. and the exports 44 cwt. Sind (including Karachi) received from the Panjab, for exar 5*703 cwt., and Bengal drew from the North-Western Provinces 2 cwt. The railway returns of indigo conveyed from district to di within each province was also very considerable, amounting to 9 cwt. A very large trade is also conducted by road and river, and haps a considerable annual production is consumed by the local configure produced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | con-<br>lg to<br>bwed<br>the<br>5,681<br>nple,<br>7,235<br>strict<br>9,235<br>per-<br>lyers                                                |
| where produced.<br>The trans-frontier trade is of some importance: the exports avera<br>value close on five lakhs of rupees, and the imports five or six thou<br>rupees. Of the exports across the frontier, the Panjab last year sent<br>maunds, valued at (^3,08,275, of which Kabul alone received more<br>half that amount, Kashmir and Bajaur each taking about R 40,000 v<br>of the dye.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | sand frontier.<br>2,916 <b>326</b><br>than                                                                                                 |
| It is however, practically impossible to arrive at an absolutely de<br>statement of the production and consumption of indigo in India, A<br>large amount is probably produced by primitive manufacturers and<br>up by local dyers of which nothing can be learned. The mover<br>of the dye from province to province both by sea and land overlap<br>other and are thus returned time after time. Thus a given quanti<br>indigo comes into Calcutta from Madras and is recorded in the coast<br>statistics. How much of that re-appears in the railway exports<br>Calcutta to the provinces of Upper India, or in the trans-frontier exp<br>or still further again and again in the transactions between district<br>district cannot be discovered, but each transaction is marked by the e<br>in marine, rail, road, and river returns. The large rail-borne quar<br>shown as conveyed from the districts in Bengal to Calcutta and also<br>the Provinces of Upper India to Calcutta figure again as the for<br>exports from that port. The only constant factor therefore, from<br>a definite conception can be drawn as to the condition of the trade i<br>nished by the total foreign imports and exports. The latter repre-<br>the surplus over-consumption for all India but is by no means the su<br>over local production. | very<br>used<br>nents<br>each<br>ty of<br>-wise<br>from<br>ports,<br>and<br>ntries<br>titles<br>from<br>reign<br>which<br>s fur-<br>esents |
| Inga dulcis, see Pithecolobium dulce, Benth.; Vol. V.<br>INK AND MARKING NUTS.<br>Various substances are used by the Natives of India in making INF<br>usual process being to mix some astringent principle such as galls or r<br>balans with one of the iron salts or oxides. The charcoal of rice wir<br>and gum arabic is, however, employed in Madras, and the Muhamma<br>generally prepare the ink they use from lamp-black, gum arabic, an<br>juicejof the aloe. The following are the plants specially mentioned a<br>juncts in the formation of inks :—<br>(1) Alnus nepalensis, D. Don. Bark forms an ingredient in nativ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | nyro-<br>h lac<br>idans<br>d the<br>s ad-                                                                                                  |
| inks.<br>(2) Cordia Myxa, <i>Linn</i> . Stewart says the unripe fruit is used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | as a                                                                                                                                       |

- (2) Cordia Myxa, *Linn*. Stewart says the unripe fruit is used as a marking nut, though its colour is less enduring than that from Semecarpus.
- (3) Phyllanthus Emblica, *Linn*. Fruits largely employed in making black ink.

INSECTS.

INK.

| Insects, | Spiders. | &c. |
|----------|----------|-----|
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- (4) Semecarpus Anacardium, Linn. f. The MARKING NUT is used by all the Indian washermen to mark the linen given them to wash. The juice of the unripe pericarp with lime forms the ink, but as it is apt to cause severe inflammation it has to be used with caution. Without the addition of lime it is often employed as ordinary writing ink.
- (5) Terminalia belerica and Chebula, the unripe fruits of either species, or indeed of any Terminalia, is combined with iron in making inK.
- (6) In schools, and even by the village merchant, black boards are  $em_{f}$ ployed, the ink being a white soft clay mixed with water ana applied with a reed.

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## **INSECTS, SPIDERS, &c.**

Insects. With the exception of the silk-worm, the bee, the cochineal, and lac, and the gall-forming insects, the INSECTA are not of very great economic importance. They belong to the great sub-kingdom of Arthropod\* or Antichletta, windon Khynnfödern ~/zoologists: is Jdivided into two seations-" water breathing and air breathing. The former corresponds to the class Scorpions, and Mites), Myriapoda (Centipedes and Millipedes), and insecta (insects proper or articulated animals with three pairs of legs, borne on the thorax). The INSECTA are referred to three divisions—Ametaboia, Hemimetabola, and Holometabola, according as they attain the adult condition without passing through a metamorphosis, or have an incomplet or a complete metamorphosis. The insects of the first division are parathe Hemiptera, Orthoptera, and Neuroptera. The Hemiptera are para-sitic on plants and animals such as the Plant-lice (Aphides), Field-bug (Pentatoma), the Cochineal, Lac, and Wax-forming Insects (Cocci), &c. To this order belong some of the gall-producing insects such as those on the lime leaves and the peticles of the puplar. Chinese galls of commerce are stated to be produced by Aphis chinensis (on Rhus semialata) and the \* n e Pistacia galls are known to be formed by Hemipterous insects. Orthoptera includes the Crickets, Grasshoppers, Locusts, Cockroaches, &c. Although some of these are eaten by man, interest in them is more connected with the destruction they often effect to crops. The Migratory Locusts (Acrydium migratorium) of Africa and Southern Asia causes  $\mathfrak{S}_{\mathfrak{L}}^{\mathfrak{v}}$ . S $\mathfrak{L}^{\mathfrak{v}}$  as  $\mathfrak{S}^{\mathfrak{alnst}}$  which human ingenuity has practically proved power Ant-The Neuroptera are the Dragon-flies, Caddis-flies, May-flies, the most lion, and Termites. The last mentioned, the white-ants, are, in imparts of India, highly destructive to timber. They live in communities like the Bee and the true Ant (see Hymenoptera), but the workers are individuals of no fully developed sex, whereas among the ants they are undeveloped females; on emergence from the egg the young termite does not pass through a quiescent stage.

The third division Holometabola includes all the insects that pass through a complete metamorphosis, *i.e.*, they exist in a larva stage between the egg and the perfect condition. The orders embraced by this division are Aphaniptera-the Flea and the Chigoe, Diptera (one of the largest orders of INSECTA embracing the House-flies and Flesh-flies, Gnats, Forestflies, Crane-flies, Gad-flies, &c.; Lepidoptera— the Butterflies and Mothsy the most beautiful and, as embracing the silk-worm, the most useful of an insects; Hymenoptera-the Bees, Wasps, Ants, Ichneumons, Saw-flies; ace.; btrepsiptera, an order of small parasitic insects found on bees and other Hymenoptera; and lastly, the Coleoptera or Beetles. I- 328

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| Commercial Classification of Insects. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RODUCED<br>Plants                              |
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| Many of the Hymenoptera are of considerable use to man such as<br>the bees and the gall-forming species, of which Cynips gallae-tinctoria,<br>forms the Oak-galls of commerce.<br>The above sketch of the classification of Insects may help to bring out<br>the natural affinities that should exist in an arrangement of the Economic<br>Products derived from the insect world. But the following popular and<br>commercial classification may be given, as it will serve to direct the reader's<br>attentior to the positions in this work where fuller details may be found :—<br>(1) Resin, White-wax, Bees-wax, &c—These products are formed by<br>Hemipterous and Hymenopterous insects See Lac (also Coccus), Wax,                                                                                          | INSECTS.<br>COMMERCIAL<br>CLASSIFI-<br>CATION. |
| <ul> <li>Honey, Oils, &amp;c.</li> <li>(2) Dyes and Tans.—These are afforded by Hemipterous, Dypterous, Hymenopterous, and Coleopterous Insects. See Coccus, Galls, &amp;c.</li> <li>(3; Fibres.—The most important insect fibre is, of course, SILK (which see), but as a curiosity it may be added that some of the spiders spin a web of such strength as to be possible of utilisation as a textile.</li> <li>(4) Medicine.—The beetle known as the Spanish-fly and the Cochineal are the chief medicinal insects. See Cantharis and for Indian substitutes see also Mylabris. The distillation of ants yields Formic acid. Galls are also employed medicinally, and the beetle Melee trianthema is sometimes collected for its medicinal oil.</li> </ul>                                                        | 329                                            |
| <ul> <li>(5) Food.—The most important food substance afforded by insects is, of course, Honey (which see, as also Bees). Grasshoppers, Locusts, and Termites are eaten, and according to the Rev. A. Campbell, the red-ant is by the Santals viewed as edible. (See ANT-GREASE.) Many of the aphides also cause the excretion of Manna (which see). In Burma a grub found in palms is considered a great luxury by the Burmans and Karens.</li> <li>(6) Ornament.—The wing- cases of beetles, but especially of Buprestis viltata, are employed for ornamental purposes, and a considerable trade is done in these., They are used to ornament <i>khas-kkas</i> fans, baskets, lace, muslin, &amp;c. The brightly coloured back of an Ichneumon is often placed on the foreheads of married Hindu .women.</li> </ul> |                                                |
| <ul> <li>(7) Pests.—A large number of Insects belong to this section, for a description of which the reader is referred to the article Pests in another volume, and to the remarks under Insect diseases in the articles on Coffee, Cotton, Indigo, Rice, Tea, Wheat, &amp;c.</li> <li>(8) Destructive Insects.—In this section has to be mentioned the whiteants, weevils, wood borers, &amp;c. Although these mostly attack dead wood or grain, they have been described along with those that infest living structure.</li> </ul>                                                                                                                                                                                                                                                                                 |                                                |
| (9) Scavengers.—Excreta injurious to man are buried deep in the earth by the useful dung-beetles which belong to the genera Coprida and Dynastida. The Necrophaga are carrion feeders. The scavenger beetle of Burma is not a pellet roller; it selects for its abode a bed of ordure which it excavates and carries to a chamber two or three feet below the surface. (10) Sacred Insects.—The Hindus do not reverence any insect, though many other animals are held sacred together with a large list of plants. Among some of the aboriginal tribes, however, beetles are viewed with religious feelings. The Máis of the Rajmahal hills bury in the ground small vessels of water into which they place the large black scavenger and other beetles.                                                            |                                                |
| INTRODUCED ECONOMIC PLANTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 330                                            |
| To give an exhaustive list of all the introduced plants found in India would occupy many pages and, perhaps, after all, serve a very unimportant purpose—at least from an economic point of view. Of the more important                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                |
| I. 330                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                |

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| INTRODUCE<br>Plants. | D Introduced Plants found in India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <b>L_1(111,3,</b>    | may be mentioned the following (taken mainly from DeCandolle's Origin of Cultivated Plants) but arranged in two sections :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 331                  | A.—Indigenous to other parts of Asia, or to Africa and<br>Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                      | The country mentioned after each plant indicates the region from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ľ                    | which it is presumed to have been originally derived.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | f. Allium Ampeloprasum, var. Porrum. LEEK. Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                      | 2. A. Cepa. ONION. Persia, Afghanistan, & C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                      | <b>3.</b> Areca Catechu. ARECA NUT. Malay.<br><b>4.</b> Artocarpus incisa. BREAD FRUIT. Sanda Islands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| [                    | 5. Avena sativa. OATS. Eastern Temperate Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1                    | 6. Beta vulgaris. BEET. Canaries: Mediterranean basin: Western                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                      | Temperate Europe.<br>7. Brassica Napus. RAPE. Europe: Western Siberia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                      | 8. B. oleracea. CABBAGE. Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                      | 9. B. Rapa. TURNIP. Europe: Western Siberia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                      | 10. Cajanus indicus. DAL.<br>11. Cannabis sativa. HEMP. Dahuria: Siberia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                      | 12. Carthamus tinctorius. SAFFLOWER. Arabia P India. $\overline{L}^{X}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | 13. Ceratonia Siliqua. CAROB TREE. Southern Coast of Anatolia.<br>14. Cicer arietinum. CHICK PEA or GRAM. South of the Caucasus ana                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | of the Caspian.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                      | 15* Cichorium Intybus. CHICORY. Europe: Northern Africa : Western<br>Temperate Asia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| l                    | z6. Citrullus vulgaris. WATER-MELON. Tropical Africa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | 17. Citrus Aurantium. ORANGE. China and Cochin-China.<br>18. C. decumana. POMELO. Pacific Islands to east of Java.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                      | 19. Cocos nucifera. COCOA NUT. Malay and Polynesia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | 20. Conea arabica. COFFEE. Tropical Africa: Mozambique                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ľ                    | 21. Corchorus capsularis. JUTE. ? Java.<br>22. Cucurbita maxima. SPANISH GOURD. Guinea.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1                    | 23. Cydonia vulgaris. QUINCE. Northern Persia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1                    | 24. Cynara Cardunculus ) ARTICHOKE. Southern Europe :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | C. Scolymus j Africa: Canaries: Madeira.<br>25. Eriobotrya japonica. LOQUAT. Japan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | 25. Eriobotrya Japonica. LOQUAT. Japan. [Siberia.<br>26. Faba vulgaris. BEAN. South of the CaspianCentral                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                      | 27. Fagopyrum esculentum. BUCKWHEAT. Mantschuria:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                      | 28. Ficus Carica. FIG. Mediterranean basin, from Syria to the Canaries <sup>A</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | 29. Fragaria vesca. STRAWBERRY. Europe : the plant is a native<br>Temperate India but was never cultivated by the Natives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                      | 20 Clusing highlight GOV DEAN Coghin Ching, Japan Java                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                      | 31. Gossypium arboreum. TREE COTTON. P Upper Kgypt <sup>an</sup> i <sup>Astr</sup> trüe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | but by some authors is believed to be a native of India. The tr $-G$ . herbaceum does not exist in India, the indigenous cotton $\overset{\text{Dein}}{\overset{\text{Dein}}{\overset{\text{S}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}{\overset{\text{C}}}}}}}}}}$ |
|                      | mainly G. Wightianum. A large series of Exotic or American                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| .                    | cottons are also grown, more especially G. hirsutum, New Orleans                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                      | Saw-ginned Darwar.<br>32. Hibiscus esculentus. OCHRO. Tropical Africa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| \                    | 33. Hordeum distichon, vulgare, and hezastichon. FORMS OF BARLEY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                      | Western Temperate Asia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1                    | 34- Lactuca Scariola. LETTUCE. Southern Europe: Northern Africa :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1                    | Western Asia.<br>-35- Lathyrus sativus. CHICKLING VETCH. South of the Caucasus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                      | <b>1.</b> 331                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| multuuded Flamts Iound III mula. (G. Wall.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RODUCI<br>Plants. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <ol> <li>Lawsonia alba. HENNA. Western Tropical Asia: Nubia.</li> <li>Linum usitatissimum. FLAX. Western Asia.</li> <li>Myristica moschata. NUTMEG. Moluccas.</li> <li>Nephelium Litchi. LITCHI. Southern China: Cochin-China.</li> <li>Panicum miliaceum. CHENA-MILLET. Egypt: Arabia.</li> <li>Papaver somnifemm. POPPY. Mediterranean basin.</li> <li>Petroselinum sativum. PARSLEY. Southern Europe.</li> <li>Phonix dactylifera. DATE PALM. Western Asia and Africa from<br/>the Euphrates to the Canaries.</li> <li>Piper Betle. BETEL PEPPER. Malay.</li> <li>Pistacia vera. PISTACHIO. Syria.</li> <li>Pisum arvense. FIELD PEA. Italy.</li> <li>Prunus armeniaca. APRICOT. China.</li> <li>Prunus domestica. PLUM. Anatolia, South of the Caucasus : North<br/>Persia.</li> <li>P. insititia. PLUM. Southern Europe: Armenia: South of the<br/>Caucasus.</li> <li>P. persica. PEACH. China.</li> <li>Saccharum officinarum. SUGAR-CANE. Cochin-China.</li> <li>Sesamum indicum. TEL or GINGELLY. Sunda Islands.</li> <li>Setaria italica. ITALIAN MILLET. China: Japan: Indian Archipelago.</li> <li>Sorghum saccharatum. SUGAR-CANE. Tropical Africa.</li> </ol>                                                                                                                  |                   |
| <ul> <li>57. Spinacia oleracea. SPINACH. Persia.</li> <li>59. Triticum vulgare. WHEAT. ? Region of the Euphrates.</li> <li>60. Zizyphus vulgaris. COMMON JUJUBE. China.</li> <li>B.—Indigenous to North or South America.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 332               |
| <ol> <li>Achras Sapota. SAFODILLA PLUM. Campeachy, Isthmus Panama,<br/>Venezuela.</li> <li>Agave americana. AMERICAN ALOE. Mexico.</li> <li>Anacardium occidentale. CASHEW-NUT. Tropical America.</li> <li>Ananas sativa. PINE-APPLE. Mexico: Central America: Pa-<br/>[nama, &amp;c.</li> <li>Anona muricata. SOUR SOP. West India Islands. [nada.</li> <li>A. reticulata. BULLOCK'S HEART. West India Islands : New Gra-<br/>7. A. squamosa CUSTARD APPLE or SWEET SOP. West India Islands.</li> <li>Arachis hypogaea. EARTH NUTS. Brazil.</li> <li>Bixa Orellana. ARNOTTO. Tropical America.</li> <li>zo. Erythroxylon Coca. COCA. Peru: Bolivia.</li> <li>zz. Capsicum annuum. CAPSICUM. Brazil</li> <li>C. frutescens. CAPSICUM. Peru to Bahia.</li> <li>Carica Papaya. PAPAYA. Central America and West Indies.</li> <li>Chenopodium Quinoa. QUINOA. Peru : New Granada.</li> <li>C. offidnalis. Ecuador.</li> <li>C. offidnalis. Ecuador.</li> <li>C. melopepo. I PUMPKIN. Temperate North America.</li> <li>Gossypium barbadense. BARBADOES COTTON, SEA ISLAND, &amp; C, &amp; C.<br/>New Granada : Mexico, West Indies (see remark above).</li> <li>Helianthus tuberosus. JERUSALEM ARTICHOKE. North America.</li> <li>Ipomcea Batatas. SWEET POTATO. Tropical America.</li> </ol> | UUE               |
| 21. Ipomcea Batatas. Sweet POTATO. Tropical America.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |

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| INULA              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| racemosa.          | The Elecampane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | 22. Lycopersicum esculentum. TOMATO. Peru.<br>23. Manihot utilissima. MANIOC. Brazil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                    | <ul> <li>23. Mannot utilissina. MANIOC. Brazil.</li> <li>24. Maranta arundinacea. ARROW-ROOT. Tropical America.</li> <li>25. Nicotiana nistica ] TOBACCO. From Mexico and Ecuador.<br/>N. Tabacum )</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                    | <ul> <li>26. Opuntia, various species. PRICKLY PEAR. Mexico.</li> <li>27. Psidium Guayava. GUAVA. Tropical continental America.</li> <li>28. Physalis peruviana. CAPE GOOSEBERRY. Tropical America.</li> <li>29. Solanum tuberosum. POTATO. Chili: Peru.</li> <li>30. Theobroma Cacao. CACAO. Amazon and Orinoco Valley.</li> <li>31. Zea Mays. MAIZE or INDIAN CORN. New Granada. <i>matro juce(i</i> The above enumeration by no means embraces all the <i>matro juce(i</i> plants now met with in India, nor indeed does it exhaust <i>thiose</i>, iP <i>i f n</i>.</li> <li>nomic value. It will suffice, however, to convey some idea of <i>A Sf A j j</i> debtedness to other countries and more especially to America. 1 he <i>f i j j j j j j j j j j</i></li></ul> |
|                    | INULA, Linn. / Gen. PL, II, 330.<br>In India some 20 species of Inula occur, many of them extremely abund-<br>ant plants, as, for example, I. Cappa, DC, a shrub met with on the Temperate<br>Himalaya from Kumaon to Bhutan, chiefly between 4,000 and 6,000 feet, but<br>in some localities ascending <sup>1</sup> even to 10,000 feet; also distributed to the Khasia<br>Hills, Manipur, Burma, China, and Java. No distinct record exists, however,<br>of any of these being used as substitutes for the Elecampane, though by »<br>mistake in synonymy, apparently, some writers regard the species below<br>as the Indian form of that drug. In Kashmir the root of I. Roylcana»<br>DC, is used to adulterate kút (see Saussurea Lappa).                              |
| 333                | Inula racemosa, Hook./.; Fl. Br. Ind., III., 292; COMPOSITE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                    | <ul> <li>Syn.— I. HELENIUM, Herb. Ind. Or. H.f. &amp; T. not of Linn.</li> <li>I. HELENIUM, Linn., is the ELECAMPANE, Eng.; AUNEE, AULw P. Fr.; ALANT, BRUSTALANT, Ger.; ENULA CAMPANA, It. &amp; *P'» VIASIL, Russian.</li> <li>Vern.—Rdsan, ARAB.; Zanjabil-i-shdmi, PERS.</li> <li>References.—Voigt, Hort.Sub. Cat., 410; Ainslie, Mat. Ind., I&gt;&gt; **'</li> <li>O'Shaughnessy, Beng. Dispens., 4*9; Fliick. &amp; Hanb., Pharmacy 380; U. S. Dispens., 15th Ed., 799; Bent. &amp; Trim., Med. Fl.9 0 » Year Book Pharm., 1*74* 0"/1*5, 238; 1881, 119.</li> </ul>                                                                                                                                                                                                  |
| MEDICINE.<br>Root. | Habitat—Western Himalaya, on the borders of fields, &c. Kashmir,<br>altitude 5,000 to 7,000 feet; Piti, altitude 9,000 to 10,000 feet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 334                | ' nary medicine. When dry the roots have a weak, aromatic odour, $1, 224$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| NIDIUM       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| uticosum.    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MEDICINE.    | resembling Orris and Camphor; in flavour they are slightly bitter, and<br>their action is as a mild tonic. They also possess diaphoretic, diuretic, ex-<br>pectorant, and emmenagogue properties. By the ancients Elecampane was<br>much employed in the complaints peculiar to females, and in America the<br>drug is still resorted to in the treatment of amenorrhoea, while it is found<br>to be sometimes beneficial in chronic diseases of the lungs when complica-<br>tions of general debility or want of tone in the digestive organs exist. In<br>France #nd Switzerland it is used in the distillation of Absinthe; see Arte-<br>misia Absinthium, Vol. I., 323.<br>[odine] see Barilla, Vol. I., p. 399, also Fucus, & Gracilaria, Vol. III.,<br>451, and IV., 174.                                                                                                                                                       |
|              | , IONIDIUM, Vent.; Gen. PL, I., 117, 970.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 335          | <ul> <li>Ionidium suffruticosum, Ging.; FL Br. Ind., /., /<?j; Wight, Ic,<br>[t. 308; VIOLACE-ffi.</li> <li>Syn.—VIOLA SUFFRUTICOSA and ENNEASPERMA, Roxb.; V. FRUTESCENS<br/>and ERSCTA, Roth.; IONIDIUM ENNEASPERMUM, DC.; I. HETEROPHYL-<br/>LUM and ERECTUM, Z&gt;C.; I. HEXASPERMUM, Dais.</li> <li>Vem.—Ratan-purus, HIND.; Nunbora, BENG.; Tandi sot, bit suraj<br/>mukhi, SANTAL; Ratan-purus, DEC; Orilai hdmarai, TAM.; Surya-<br/>kdnti, nila kobari, purusha ratnam, TEL.; Chdrati (according to Ains-<br/>lie), SANS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
|              | <ul> <li>References. #&lt;,*\$., Fl. Ind., Ed. C.B.C., 218; Voigt, Hart. Sub. Cal.ş<br/>77; DaU. &amp; Gibs., Bomb. Fl., 12; Rev. A. Campbell, Econ. Prod. Chutia<br/>Nagpur, Nos. 7\$17 and 8171; Rheede, Hort. Mai., IX., 60; Elliot, Ft.<br/>Andhr., 131,160, 171; Ainslie, Mat. Ind., II., 267; O'Skaughnessy, Beng.<br/>Dispens., 209; Dymock, Mat. Med. W. Ind., 2nd Ed., 66; U.S.Dis-<br/>pens., 15th Ed., 817; Moodeen Sheriff, Mat Med. South India, 32 •<br/>Pharmacographia Indica, /., /Jo/ Trans. AgriHort. Soc, VII., 71'*<br/>Gazetteers: —Bombay (Katiara), XV., 427f NW. P. (Bundelkhand),<br/>!•&gt; 7P; \Agra), IV., Ixxii.; (Himalayan Districts), A"., 30\$; Mysore<br/>m and Coorg, I., 57 Nellore Man., 137.</li> <li>Habitat.—A small herbaceous plant abundant throughout the warmer<br/>parts of India, from Agra to Bengal, Orissa, and the Southern Konkan<br/>(common at Belgaum and Kanara).</li> </ul> |
| Root.<br>338 | Medicine.—According to Ainslie the LEAVES and tender STALKS are<br>used by the natives of Southern India as a demulcent. They are em-<br>ployed in decoction and electuary in conjunction with some mild oil, in<br>preparing a cool liniment for the head. Of the decoction, he adds, about<br>an ounce and a half is given twice daily. Dr. Moodeen Sheriff (in his<br>forthcoming work) says it is demulcent and refrigerant and is useful in<br>some cases of gonorrhoea and of scalding of urine. According to the Rev.<br>A. Campbell the Santals employ the ROOT in bowel complaints of children<br>accompanied with black excreta. In the <i>United States Dispensatory</i> it is<br>stated that the root of a species of Ionidium has attracted some attention                                                                                                                                                               |
| 339          | in the treatment of elephantiasis.<br>Chemistry.—According to the <i>Pharmacographia Indica</i> , "The root contains an alkaloid soluble in ether, and alcohol, not easily crystallized; its solution in the form of a salt, which it readily forms with the mineral and vegetable acids, is precipitated by potassio-mercuric iodide, iodine in potassium iodide, tannin and the alkalies. It also contains quercitrin, allied to the viola-quercitrin of Man deli n; and another colouring matter soluble in water, but insoluble in amylic alcohol, an acid resin, and quantity of mucilage and oxalates."<br>Sir W. O'Shaughnessy failed to detect the least trace of the active principles emetine or violine in samples of the plant procured from the Koyal Botanic Gardens, Calcutta.                                                                                                                                         |
| -            | I. 339                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| IPOM^EA<br>aquatica.       | The Kulmi Sag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| MEDICINE.                  | SPECIAL OPINIONS.—§ "An infusion of the root is used as a diuretic<br>and given in gonorrhsea. The leaves are demulcent. Indigenous in Bel-<br>gaum " {Surgeon-Major C. T. Peters, South Afghanistan).<br>Ipecacuanha, see Cephaelis Ipecacuanha, Rich.; VOL. If., p. 247.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                            | IPHIGENIA, Kunih.; Gen. PL, III., 824.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>340</b><br>Dye.         | [JjLIACK*-<br><b>Iphigenia indica,</b> Kunth.; Linn. Soc your., Vol. XVIL, 45° ><br>Syn.—MELANTHIUM INDICUM, Linn.; ANGUILLARIA INDICA, R. BT»<br>Vern.—Chutia chandbol, SANTAL.<br>References.—Rev. A. Campbell, Report on Econ. Prod. Chutia NagP»*><br>No. 8703; Kdnara Gazetteer, XV., 444.<br>Habitat.—A small herb appearing during the rainy season in trbpical<br>and sub-tropical India: ascends the Himdlaya to altitudes of 6,000 to<br>7,000 feet. Is frequent from Chutia Nagpur to Kanara, also common in<br>Burma and Ceylon.<br>Dye.—The Rev. A. Campbell mentions that the Santals obtain a red                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 341                        | dye from the flowers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 342                        | IPOM/EA, Linn./ Gen. PL, II., 870.<br>Ipomaea angustifolia,/ <w?. 20\$;="" convolvulacee.<="" fubr.="" ind.,="" iv.,="" td=""></w?.>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                            | <ul> <li>SynI. DENTICOLATA, Bf. / I. FILICAULIS, Blume; CONVOLVULUS LINIFOLIUS, Wall., Cat, 1389; C. MEDIUM, Roxb.; C. FILICAULIS, VahU</li> <li>VetnTala-neli (according to Rheede), TAM.; Konda, sita savaram (according to Elliot, who remarks that savaram and lanjasavaratna.TC^f<sup>mes</sup> given by Heyne to this plant, as also the Sanskrit synonym Prasdron, which more correctly should be given to Paederia fcetida), TEL.</li> <li>ReferencesRoxb., Fl. Ind., Ed. C.B.C., 159 f Dale. &amp; Gibs., Bomb.FU 16s / Sir W. Elliot, FL Andkr., 14, 62, 97, 106, 169; Rheede, Hort. BUM,, XI., t. SS ; GazetteersBombay {Kanara), X V., 439 ; N W. P. {Agr»h IV., Ixxv.; Mysore and Coorg, /., 56.</li> <li>HabitatA diffuse twining biennial, found on the hills of the Deccan Peninsula and distributed to Bundelkhand, the Khasia Hills, Malacca, Ceylon, &amp;c.</li> </ul>                                                                                                                                                                                                                                                                        |
| 343                        | <ul> <li>I. aquatica, Forsk.; Fl. Br. Ind., IV., 210.</li> <li>SynCONVOLVULUSREPENS and REPTANS, Roxb.: I. REPTANS, Poir.f<br/>I. REPENS, Roth.; I. SUBDENTATA, Miq.</li> <li>VernKalmi-sdk, BENG.; Kulum sag (PARBUTIAH), NEPAL ; Kalmi-sag,<br/>nan, NW. P.; Ganthian, ndri, ndli, PB.J Naro, SIND ; Nhlichi baji,<br/>BOMB.; Sarkarei valli, koilangu, TAM.5 Tuti-kara, TEL.; Kan-kun,<br/>SING.; Kalambi, SANS.</li> <li>ReferencesRoxb., Fl. Ind., Ed. C.B.C., 162; Voigt, Hort. Sub. CaL&gt;<br/>355; Dalz. &amp; Gibs., Bomb. Fl., 164; Stewart, Pb. Pl., 150; Elliot, M<br/>Andhr., 185; Rheede, Hort. Mal.,XI.,t. 52 ; Stocks, Account ofSind;<br/>Rev. A. Campbell, Report Econ. Prod. Chutia Nagpur, No. Si33 ;<br/>O'Skaughnessy, Beng. Dispens., 506; U. C. Dutt, Mat. Med. Hind., 3021<br/>Dymock, Mat. Med. W. Ind., 889 ; Taylor, Medical Topography of Dacca,<br/>48; Atkinson, Econ. Prod. NW. P., V. 96; GazetteersBombay<br/>(Kdnara),XV.,439? NW. P. (Bundelkhand),I., 82;(Agra),IV.,lxxy-i<br/>Indian Forester, III., 237 ; XII., App. 17; XIV., 39t; AgriHort.Soc.<br/>of Ind. Trans., IV., 103 s Journal (Old Series), X., 20.</li> </ul> |
| MEDICINE.<br>Juice.<br>344 | <ul> <li>ly abundant on the surface of tanks in Bengal. In Madras and Ceylon it is regularly cultivated as a vegetable.</li> <li>MedicineIn Burma the JUICE is said to be employed as an emetic in 2<sup>u</sup> f.?.<sup>Oa</sup> <sup>v</sup> <sup>n</sup> <sup>n</sup> <sup>n</sup> <sup>or</sup> <sup>o</sup> <sup>p</sup> <sup>ium</sup> P<sup>oison</sup> ing- O'Shaughnessy says that the Juice when dned is nearly equal to scammony in purgative efficacy.</li> <li>I. 344</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| The Kulmi Sag. (G. Watt)                                                                                                                                      | IPOMiEA<br>aquatica. |
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|                                                                                                                                                               |                      |
| Food.—The young SHOOTS, LEAVES, and ROOTS of this floating aqua-<br>tic species are universally eaten as a vegetable in the region m which                    | FOOD.<br>Shoots.     |
| it is found. In Lower Bengal, where a superabundance of stagnant                                                                                              | 345                  |
| water occurs, in the form of tanks, it is to be found throughout the year, but<br>in other parts of the country it is more or less cultivated. At times bunds | Leaves.              |
| are made across the outlets of marshes to prevent their being drained, and                                                                                    | Roots.               |
| cuttings of the plant are then placed in the mud all over the swamp. In<br>this semi-cultivated condition crops are obtained, where otherwise the plant       | 3*7                  |
| could scarcely exist. In Madras and Ceylon, however, it is regularly culti-<br>vated and trained to exist on fields not inundated. In a circular letter       |                      |
| addressed to Local Governments, in which information was called for on                                                                                        |                      |
| the Economic Products described in this volume, full particulars were<br>rerprded regarding this vegetable. The following abstract of these replies           | 1                    |
| may be here given :                                                                                                                                           |                      |
| Bengal.—Found wild in tanks: is regularly eaten as a vegetable.                                                                                               | {                    |
| Assam.—An aquatic weed which grows in almost all tanks and jeels or                                                                                           |                      |
| low-lying tracts covered with water. The weed generally begins to grow<br>with the commencement of the rains and remains till January or February             |                      |
| when it begins to wither on the top of the water. In <i>jeels and</i> tanks where                                                                             |                      |
| the water never dries up, this weed is found all the year round. The leaves                                                                                   |                      |
| and stems are gathered, cut to pieces, boiled in acid, alone or with fish,                                                                                    | 1                    |
| and eaten by the Assamese with rice. They are supposed to have a very cooling effect if boiled on the previous night and eaten the first thing in             |                      |
| the morning. The weed is considered to be very wholesome for females                                                                                          |                      |
| who suffer from nervous and general debility.                                                                                                                 |                      |
| <i>Madras.</i> —In the Madura District alone the extent of cultivation is said to be about 600 acres. The kind produced is to a large extent that with        |                      |
| white roots. It is sown in August and harvested from December to March,                                                                                       | ļ                    |
| The creeper is cultivated in Padugat, Senval, and Karisal soils. The land                                                                                     |                      |
| is ploughed three times, manured, and ploughed again, then plots are                                                                                          |                      |
| formed and watered. Thereafter the creepers are planted in small pieces<br>of six inches at a span's length from each other. Ten loads of the creeper         |                      |
| are required to plant one acre. The creepers are first grown amidst <i>ragi</i> .                                                                             |                      |
| Weeding is done after one month. The cost of cultivation is R20. The roots are sweet and after being boiled largely eaten.                                    |                      |
| Burma.—In the Pegu District it is found growing wild as a creeper<br>floating on tanks, fields, streams, &c. The Burmese eat it, and it is                    |                      |
| so much a favourite that many persons are engaged collecting and selling                                                                                      |                      |
| it. The price of a bundle is one or two pice, and being very plentiful<br>only a small profit of a few rupees can be made on it.                              |                      |
| In the Akyab District the area of cultivation is about 30 acres. It is<br>first a spontaneous growth in tanks, swamps, &c. Slips are broken off and           |                      |
| about June are planted out. It is fit for use in three weeks and continues                                                                                    |                      |
| growing nearly throughout the year so long as there is water. Cost of cul-                                                                                    | .                    |
| tivation about Rio or R15 an acre. Profit about R60 or R70 per acre-                                                                                          |                      |
| Portions of land are embanked by which the water is kept from escaping<br>and the cuttings are then put down. It is used as a vegetable.                      | \$                   |
| In the Mandalay District it is found in abundance in tanks and marshy                                                                                         | r <b>i</b>           |
| localities, and is extensively used as one of the most favourite vegetable diets.                                                                             |                      |
| In the Thongwa District it grows wild and is largely eaten by the people. In the Maubin Sub-division the annual produce is about 1,000 baskets.               |                      |
| In the Bhamo District it is commonly met with and is much used by<br>the natives in^making curries for which the leaves and tender tips are em-               |                      |
| ployed. Similar information has been communicated regarding the Upper                                                                                         |                      |
| I. 347                                                                                                                                                        |                      |
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| IP01VUEA<br>Batatag | The Sweet Potato.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <u>Batatas.</u>     | Chindwin, Kyaukpyu, Bassein, Amherst, Eastern division of Upper Bur<br>Toungoo, and Ruby Mines Districts. ^nnA< near<br>SPECIAL NOTE§ '' Kalmi is largely cultivated in shallow P <sup>ona</sup> J <sub>Hnary</sub><br>the villages of Bengal on account of its leaves which are ******* thunder<br>vegetable. They are said to be cooling '' {Assistant Surgeon Snio w»<br>Bhattacharjiy Chanda, Central Provinces),<br>Fodder.—See Vol. III., p. 415.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 348                 | Ipomaea Batatas, Lantk.; FL Br. Ind., IK 202.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                     | SWEET POTATO.<br>Syn.—BATATAS EDULIS, Chois.; CONVOLVULUS BATATAS, Linn.f<br>EDULIS, Thunb.; C. ESCULENTUS, Salisb.<br>Vern.—Mita-aU (sweet potato), shakarkand, HIND.; Ranga-alá, lal-alá<br>or lal-h dx de dnl &   =the re d fim chine 4lu (the white), BENG.I<br>or lal-h dx de dnl &   =the re d fim chine 4lu (the white), BENG.I<br>Sakar-kenda, SANTAL; Goria alá (white form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (white form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (white form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>Sakar-kenda, SANTAL; Goria alá (mhite form), boga or ranga (red), ASSANI<br>MAR.; Sakaria, Guz.; Vallikilángu, sakkarei-vellei-kelangu, TAN.;<br>MAR.; Sakaria, Guz.; Vallikilángu, sakkarei-vellei-kelangu, TAN.;<br>MAR.; Burn.; Batala, SING.; Lardak Lahori (= Lahore Carrot),<br>m, ouk-ni, BURN.; Batala, SING.; Lardak Lahori (= Lahore Carrot),<br>Di 1501                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| HISTORY.<br>349     | <ul> <li>New M., Borki, Billin, Silver, Editate Jamer (Pl., 150)</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CIBIC., 1622; Struast, ***;</li> <li>Refferences — #**&amp;., /7. Budl. Ed. CiBIC., 162; Struast, ***;</li> <li>Refferences — #**</li> <li>Re</li></ul> |

| The Sweet Potato.   (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | IPOMiEA<br>Batatas.                        |
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| either compare it to indigenous tubers, or allude to its sugary property—of<br>these names being ancient.<br>Medicine.—The ROOTS of this plant have a laxative property. Baden<br>Powell says that in the Panjáb the natives regard^ the sweet-potato, "as<br>hot, useful to strengthen the brain and in special diseases."<br>SPECIAL OPINIONS.—§ "The laxative properties of the roots must be<br>very slight, as they are eaten in large quantities as a vegetable without<br>any apparent effect" {Brigade Surgeon G. A. Watson, Allahabad).<br>"Sweet potato is indigestive" (V. Ummegudien, Mettapollium, Madras).<br>Food.—The sweet potato is eaten by all classes of the natives, either<br>in curry, or simply roasted, or after having been cut in half, lengthwise, and<br>fried. Another way of preparing the sweet-potato is to boil it, cut it in<br>slices and add rasped coconnut milk and sugar. In this way it becomes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE.<br>Roots.<br>350<br>FOOD.<br>351 |
| slices, and add rasped cocoanut milk and sugar. In this way it becomes<br>a faiily good dessert. It is also boiled, mashed, and made into pudding<br>in the usual European style with sugar, egg, and milk (L. Liotard).<br>Fodder.—The TOPS of the sweet-potato are used as cattle fodder, and<br>when young are eaten as a pot-herb. See Vol. III., p. 415.<br>Cultivation.—Bengal.—There are two varieties cultivated: one with<br>purple tubers and purple flowers which is known as Sakarkanda, and the<br>other with white tubers and flowers—the Chine dlu. Sweet potato requires<br>a sandy soil and is generally raised on lands that will scarcely grow any<br>other crop. Five to seven ploughings are given and the land then raised in<br>ridges often leaving a narrow belt between the trenches and ridges. It is<br>propagated by cuttings, to supply which creepers are grown near the home-<br>steads in a damp locality. Before planting, these creepers are pulled up<br>and cut into pieces, each containing two knots, the portions close to the<br>roots being rejected. The cuttings are planted in the ridges, one of the<br>knots being buried in the ground and the other left above. The planting<br>time is from August to September. When the cuttings have taken root,<br>the ridges are properly made, and later on the plants are earthed up. The<br>harvest time extends from October to November. The yield is from 20 to<br>30 maunds per bigha (=§rd acre.). Chine dlu sells from eight or ten annas<br>a maund and Sakarkand from twelve to fourteen. A kind of thread-like<br>worm sometimes grows inside the roots and does much injury to the plant<br>(Annual Report, Director of Land Records and Agriculture^ 1886. 4>. | TION.<br>Bengal.<br>353                    |
| In a special report furnished for this work the Director of Land<br>Records and Agriculture writes: "Sakarkand.r-In the Bhagulpore Division<br>the fields are ploughed and harrowed two or three times. The seeds are<br>then scattered in June-July, and dug out in January-February. It is<br>grown to a small extent in Chota Nagpur for home consumption. There<br>are two varieties: one is known as <i>desi</i> (country) or red, and the other<br><i>belati</i> (English) or white. The latter is fast driving the former out of cul-<br>tivation. The area under <i>aluas</i> and <i>sulknis</i> (species of sweet potatoes or<br>yams) is said to be considerable in the Mozufferpore districts, <i>viz.</i> , 6<br>per cent, of the whole cultivation. This article of diet is one of the chief<br>foods of the poorer classes in Mozufferpore, and lasts from October till<br>March, being dug up as required."<br><i>Assam.—In</i> a special report the Director of Land Records and Agricul-<br>ture states : "The sweet-potato is grown in the villages in or around the<br>homesteads. It is sown in September or October and taken up in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Assam.<br><b>35</b> 4                      |
| January."<br>North-West Provinces.—Mr. E. T. Atkinson {EconomicProducts,Part<br>V., 19) says the sweet potato or Shakrkand, rakt-alu, or pind-alu is cul-<br>tivated all over these provinces. There are two principal varieties, one<br>with white and the other with red tubers, both of which are highly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NW.<br>Provinces<br>355                    |

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| IPOMiEA<br>Batatas.                    | The Sweet Potato.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| CULTIVA-<br>TION.<br>NW.<br>Provinces. | esteemed as palatable and nutritious articles of food when boiled or<br>roasted. The young leaves and tender shoots are eaten in curries and<br>used as greens, and the leaves themselves are considered an excellent<br>fodder for cattle."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Central<br>Provinces.<br><b>356</b>    | <i>Central Provinces.</i> — <i>Mr.</i> J. B. Fuller reports : "This is commonly cultivated during the cold weather in the beds of streams and on the sloping banks of large rivers in company with <i>Brinjal</i> or <i>Bhata</i> (Solanum melongenum). Full details of area are not available. In the Saygor, Seoni, and Hoshangabad districts it is returned as covering over 500 acres, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Panjab.<br>357                         | it is grown on over 700 acres in Jubbulpur."<br><i>Panjdb</i> ,—Stewart wrote: " the sweet potato is commonly cultivated (in<br>the cold weather) in the eastern part of the Panjdb plains; the root is eaten<br>as a vegetable."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Bombay.<br>358                         | Bombay.—In a special report furnished for this work the DiPector of<br>Land Records and Agriculture writes :—"Sweet potato is grown every-<br>where in the Presidency. In 1887-88 it occupied 10,666 acres. It is irri-<br>gated and manured. There are two varieties, the white and the red. The 5<br>latter is smaller and sweeter. In Gujarat it is grown in the cold weather,<br>but in the Deccan and the Konkan any time in the rains or cold weather.<br>It takes about four to six months to mature. The land is ploughed,<br>harrowed, weeded, and dressed with manure and sown from a last year's<br>bed which has been watered and kept for the purpose. The potato rots<br>in the ground and sends out small shoots which consist of a knot or eye,<br>with a single leaf attached. The shoots are planted in the prepared beds<br>and irrigated. About 4,000 to 5,000 shoots go to an acre, and produce<br>from 1J to 5 tons. The price varies from Rf to R2 per Indian maund.<br>The young shoots and leaves are eaten as a pot-herb. The tubers are<br>eaten both boiled and roasted. They are largely used on fast days.<br>Dried and ground into flour they are also made into cakes which the higher                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Madras.<br>359                         | classes eat on fast days. During the rainy season, when the grain stock<br>of poorer cultivators runs short, sweet-potato not uncommonly forms part<br>of their bread stuff. The mature vine is an excellent cattle food. The<br>average yearly outturn may be estimated at 8,90,400 maunds."<br>In the report of the Crop Experiments mention is made of two kinds (i)<br><i>Deshi</i> or <i>Mulki</i> , with heart-shaped leaves only slightly indented and root<br>rather small but sweet, often red coloured: (2) <i>Vildyiti</i> introduced some<br>fifteen years ago, leaves deeply lobed, roots large and never red coloured.<br>The cultivation of the crop is regarded good for the land. Out of a field<br>of sweet-potatoes three rows were pulled and the produce weighed, <i>vis.</i> ,<br>947ft. Mr. Heaton, who reports on the experiment, remarks that if the<br>southern part of the field had given as good a return as the northern, the<br>outturn would have been 13,4891b per acre. The yield was by no means a<br>first-rate one. The roots were of medium size, not big. 1 estimate, he<br>adds, that a 16-anna crop would yield from 18,000 to 20,000& an acre.<br>Mr. Price, of the Southern Maratha Survey, experimented on sweet-pota-<br>toes many years ago and obtained as the result a yield of 6,200fb per acre.<br><i>Madras.</i> —»In the Coimbatore Manual it is stated "white and red<br>varieties are grown in gardens, the cuttings being planted from September<br>to December, and the roots dug out from January to March. The land<br>is well ploughed, manured, and ridged. The cuttings, which are from<br>«Me <sup>*</sup> e <sup>*</sup> ? P <sup>1antifed</sup> in a nursery a month previously, and are a foot long, are<br>SLJ1 <sup>e</sup> K <sup>on the</sup> S <sup>1de off not appstide soft ne nd<sup>*</sup>e<sup>*</sup> e<sup>*</sup> Materian <sup>*</sup> only on C<sup>*</sup> or so, as the <sup>*</sup> e p « s cover the ground. It is<br/><i>radium</i> in <sup>*</sup> only on <sup>*</sup> on so, as the <sup>*</sup> e p « s cover the ground. It is<br/><i>radium</i> in <sup>*</sup> only on <sup>*</sup> on so, as the <sup>*</sup> only off on the varieting is a<br/><sup>*</sup> 3559</sup> |

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| The Sweet Potato. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | IPOMJEA<br>Batatas.          |
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| nominal half. A garden land of 1*35 acres has been known to let to a tenant for R70 per annum, one of the crops being sweet potatoes. The value of the outturn of sweet potatoes was perhaps R130. The Government assessment on 1*35 acres would be R2 and water rate R4-8."<br>The following special reports, contributed for this work, may be here given. Mr, H. Sewell, Collector of Cuddapah, wrote :" The creepers are first planted in June and July, and when multiplied are transplanted in October. The crop of potatoes is dug out in January and February. The soil required is red sand. The cost of cultivation is R15 and profit R25 a cawndy. The potatoes are sold at 2 annas a thk."<br>Mr. H. Willock, Collector of Trichinopoly, stated :"The area under sweet potato ( <i>valli kalangu</i> ) cultivation  in this district is only about 150 acres. The outturn is estimated at about Rio worth per acre per annum. The cost of cultivation is about R6. This tuber is cultivated to a very small extent in patches in <i>olapperi</i> lands under well and channel irrigation. It is generally grown on red loam or sandy soil." Mr. Goodrich, Collector of Bellary, reported :"The area devoted to sweet potato in three taluks is 112 acres, but the extent in other taluks cannot be estimated. The time of sowing varies according to locality from June to November, and that of reaping from December to March. The average cost of cultivation per acre is R29, the highest being R45, and the lowest R12. Red and mixed soils are those best suited to this crop. The ground should be ploughed and harrowed twice, and irrigated once, in eight days. It is eaten as a vegetable, and is also sometimes made into dishes. The annual yield of this crop is about 50,700 maunds, and the cost price varies from 8 annas a maund to 10 maunds for a rupee." | CULTIVA-<br>TION.<br>Madras. |
| Burma.—The following special reports have been received regarding<br>sweet-potato cultivation in Burma :—" In the Upper Chindwin district it is<br>grown on'soft soil. The ground is broken and small bits of stems planted.<br>No watering is required. It is planted in September and October, and<br>the potatoes are collected in February and March. It is grown largely,<br>afd sold at R3 per 100 viss. But the export is not much."<br>"In the Lower Chindwin district it is very plentiful. The grounds<br>selected are usually on the islands in the river. It is boiled, cooked, or fried                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Burma.<br>360                |
| and then eaten."<br>"In the Prome district, the area under cultivation is 21*50 acres. It is<br>sown in July and reaped in March. The cost of cultivation is R3-8 for a<br>quarter of an acre, yielding potatoes to the amount of 150 viss, which<br>being sold for R9 leaves a profit of R5-8. Slips are taken and planted in<br>sandy soil in a hole of a span's depth. It is cooked and eaten. The<br>annual production is estimated at 13,000 viss, and the cost at the place of<br>production is given as R5-8 or R6 per 100 viss "<br>"In the Pegu district it is cultivated in moderate quantities by Shan and<br>Chinese gardeners, The ground is divided into ridges about a foot high<br>and on them the tubers are planted. When ready for market the tubers<br>are dug out and sold at 10 to 12 annas per 10 viss. It is generally grown<br>on sandy loam near streams, as it does not form large tubers in the<br>shallow hard soil of the hills. It is planted at the beginning of the rains,<br>and the tubers are taken up in the cold weather."<br>"In the Akyab district, the area cultivated is about 50 acres. It is sown<br>about October or November and dug up in about three months. Cost<br>of cultivation about R30 per acre. The soil has to be ploughed, manured,<br>and made into ridges on which the cuttings are planted. It thrives better<br>when cowdung is used as manure. It is used as food, but only as a delicacy<br>and eaten in small quantities."                                                                                                                                                                                                                                                                                                                                                                                               | -                            |

| IPOMiEA<br>biloba.          | The Sweet Potato.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| CULTIVA-<br>TION.<br>Burma. | "In the Kyoukpyu district it is grown all over, as both the leaves and<br>the tubers are eaten by the natives."<br>"In the Eastern Division, Upper Burma, it is cultivated to some extent<br>in two varieties—the yellow and white."<br>"In the Toungoo district it is largely sown by Shansin the river silt, at<br>the end of the rains, and at other times where loose, friable, and sandy soil<br>is obtainable."<br>Similar notices are given for the other districts of Burma, thus showing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ALCOHOL.<br>361             | a very extensive cultivation.<br>Alcohol prepared from Sweet Potatoes.—The utilisation of the sweet-<br>potato as a source of alcohol has recently been discussed in several news-<br>papers. M. Ralu, it would appear, has obtained patents for the distillation<br>of a specially prepared flour from these tubers. A Company has Mso been<br>formed at the Azores, and the alcohol it produces is said to be readily<br>purchased by Lisbon merchants to be used in the fortification of wines.<br>• The alcohol, M. Ralu reports, of which we have samples, is superior in<br>quality to that of the best marks of France. The distillery obtains 12 per<br>cent, ( <i>i.e.</i> , 12 litres per 100 kilogrammes of sweet-potato) of alcohol. We<br>have experimented with the sweet-potatoes of Algeria. They give 13*4<br>litres of alcohol per 100 kilog. The sweet-potato of Martinique and Brazil<br>has given 15 litres. There is here therefore a very rich material for dis-<br>tillation. Ordinary potatoes yield only 3 litres of alcohol per 100 kilog."<br>As compared with these figures it may here be added that with the excep-<br>tion of Indian-corn sweet-potatoes are cheaper than any of the substances<br>used in distillation, while they yield the highest recorded percentage of alco-<br>hol. Thus, for example, wheat yields from 28 to 30 litres per 100 kilog.;<br>barley from 22 to 23 ; oats from 20 to 21; buck-wheat from 24 to 25; In-<br>dian-corn from 28 to 30; rice from 32 to 33; and sweet-potato flour from<br>maize it has been stated there is a great saving of time and combus-<br>tibles when distilling from the flour of sweet-potato. Alcohol from maize<br>costs 10/. per hectolitre more to make, and when made, sells from Bf. to<br>ic/. less than the alcohol from sweet-potato. The writer of the article<br>in the <i>European Mail</i> , from which publication the statements given above<br>have been derived, very rightly remarks that it remains to be seen whether<br>it would pay to cultivate the sweet-potato on a large scale as a source of<br>alcohol. Doubtless the price of the tuber would rise considerably, and<br>oth |
| 362                         | Ipomaea biloba, Forsk.; Fl. Br. Ind., IV., 212.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                             | <ul> <li>Syn.—I. MARITIMA, R.Br.; Blume; I. PES-CAPRCE, Roth.; Chois; DC, Prod.; Date, and Gibs., Bomb. Fl; CONVOLVULUS PES-CAPR(E, Linn., Roxb., Fl. Ind; C. BILOBATUS, Roxb.; BATATAS MARITIMA, Bojer.</li> <li>Vern.—Dopati-latd, HIND.; Chhdgulkúri, BENG.; Kansdrinata, ORISSA; Marjdavel, marayadavel, marjavel, BOMB.; Bdlabdndi tige{=ha.re creeper}, chevulapilli tige, TEL.; Pin-lai-ka-aum, BURM.; Mittiú-bintambúrd, SING.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 163; Voigt, Hort. Sub. Cal., 356; Dale. &amp; Gibs., Bomb. Fl, 164; Trimen, Cat. Ceylon PL, 60 &gt; Rheede, Hort. Mai., XL, t. 57; Rumph., Herb.Amb., V., t. TS9,fig-''' Sir W. Elliot, Fl. Andhr., 20, 24, 37 / Mason, Burma ana Its People, 437 783; Bidie, Report on Madras Drugs Calc. Inter, JSxh., 1883-84*</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | Dymock, Mat. Med. W. Ind., 2nd Ed., 563; Lisboa, U. PL Bomb., 285 i<br>Indian Forester, IX., 238; XII., 329; Hunter, Gazetteer Orissa, IL, 17* i<br>I. 362                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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| The Moon-Flower. (G. Watt.)                                                                                                                                 | IPONUEA<br> bona-nox. |
| Madras Manual of Admin., II., 27; Journal, AgriHort. Soc. Ind., IX.,                                                                                        |                       |
| 176,177; X.,20.                                                                                                                                             | 1                     |
| Habitat.—A common plant near the sea, especially on the western                                                                                             |                       |
| coast.<br>Medicine.—The parenchima of the ROOT contains starch and large con-                                                                               | MEDICINE.<br>Root.    |
| glomerate raphides. The whole plant is very mucilaginous. The LEAVES                                                                                        | ,363                  |
| are applied externally in rheumatism and colic, and the JUICE is given as                                                                                   | Leaves.               |
| a diuretic in dropsy, and at the same time the bruised leaves are applied                                                                                   | 364                   |
| to the dropsical part ( <i>Mat. Med. West, Ind.</i> ).                                                                                                      | Juice.                |
| Fodder.—Roxburgh remarks that it is most useful in binding loose<br>sand, thereby preparing the way for the growth of other plants upon pre-                | 365                   |
| viously barren shifting sands. The Madras Manual pronounces it as one                                                                                       | FODDER.               |
| of the most important sand-binding plants. Goats, horses, hares, tame                                                                                       | 366                   |
| rabbits, and rats are also said to be fond of it. Cows fed on it yield                                                                                      |                       |
| tainted milk. From the summit of the thick, fleshy, tap root spread many                                                                                    | ļ                     |
| succulent red branches, beaiing bi-lobed leaves on long petioles, very                                                                                      |                       |
| much resembling a Bauhinia leaf.<br>Sacred.—Lisboa alludes to a reputed practice of twining the creeper                                                     | SACRED.               |
| around the cot of a Hindu mother, apparently from the idea that as it binds                                                                                 | 367                   |
| the sand on the sea-shore, so it will secure _the child to the mother against                                                                               | 1                     |
| the goddess of destiny.                                                                                                                                     |                       |
| <b>Ipomaeabona-nox,</b> <i>Linn.; FL Br. Ind.</i> , IV., 197; Wight, Ic, t. T361.                                                                           | 36S                   |
| THE MOON-FLOWER, a name derived from the fact that the                                                                                                      | 1                     |
| large, white, and sweetly-scented flowers open only at                                                                                                      | 1                     |
| night.                                                                                                                                                      |                       |
| Syn.—CALONYCTION SPECIOSUM, Chois.; IPOMCEA GRANDIFLORA, Roxb.                                                                                              |                       |
| This should not be confused with <b>Lettsomia bona-nox</b> , <i>Roxb</i> . (=Rivea hypocrateriformis, <i>Chois</i> ).                                       |                       |
| Vern.—Dudiya-kulmi (I. grandiflora, Roxb.), ildl kalmi, BENG. •, Gul~                                                                                       |                       |
| chandni, BOMB.; Naga-műghatei, TAM.J Nagara-mtikuttykai, TEL.;                                                                                              |                       |
| Munda-valli, MALAY; Nway-ka-zun-a-phyu, nweka-zumbyi, BuRM.;                                                                                                |                       |
| Alanga, SING.; Pathmapu-todami (orpatmapu), SANS.                                                                                                           |                       |
| <b>References.</b> — Roxb., FL Ind., Ed. C.B.C., 167; Kurz, For. FL Burnt.,<br>II., 217 / Dale. & Gibs., Bomb. Fl., 164; Griff. Notul, IV., 286; Sir W      |                       |
| Jones, Asiatic Researches, IV., 257; Mason, Burma and Its People, 437,                                                                                      |                       |
| 783; Ainslie, Mat. Ind., II., 219; OPShaughnessy, Beng. Dispens., 506;                                                                                      |                       |
| Dymock, Mat. Med. W. Ind., 2nd Ed., 561; Journal AgriHort. Soc.                                                                                             |                       |
| Ind., VI., 47; X., 20; (Rev .J. Long <i>£</i> *'ws Roxburgh's information regarding Ipomaea Tarpethum, Br., as applying to this species /                   |                       |
| according to <b>Roxburgh</b> these species both bear the name Dud {or Dudiya                                                                                |                       |
| Kulmi).                                                                                                                                                     |                       |
| Habitat.—The typical form of this plant is a native of America, early                                                                                       |                       |
| introduced into India, and in some parts of the country now become quite<br>naturalised. The form which Roxburgh called I. grandiflora is, by the           |                       |
| Flora of British India, viewed as an indigenous variety of the species, with a                                                                              |                       |
| less tendency to have lobed leaves. It is found in most parts of tropical India,                                                                            |                       |
| and from Assam and Bengal to Tenasserim, Malabar, &c. The intro-                                                                                            |                       |
| duced form has, however, become so thoroughly acclimatised that it is often<br>difficult to distinguish the one from the other. The <b>P</b> ay L Long gave | <u> </u>              |
| difficult to distinguish the one from the other. The <b>Rev.</b> J. Long says that it flowers in the cold season in the Circars and in the rains in Bengal. | Seeds.                |
| Medicine.—Dried, the CAPSULES and SEEDS, as well as the FLOWERS,                                                                                            |                       |
| LEAVES, and ROOTS are included amongst the medicines supposed to have                                                                                       | Flowers               |
| some merit as remedies against snake-bite (Ainslie). In the Materia Medica                                                                                  | 271                   |
| of Western India it is stated that the capsules are reported to be used in the<br>Konkan for the same purpose as described above in connection with         |                       |
| Madras.                                                                                                                                                     | 372                   |
|                                                                                                                                                             | Roots                 |
| • <sup>31</sup> • I. 37                                                                                                                                     | <b>3</b> 373          |
|                                                                                                                                                             |                       |

| IPOMJEA<br>digitata                        | The Asgand.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| -urgnata.                                  | SPECIAL OPINIONS.—§ " It is sometimes used as food, and is supposed<br>to have mild alterative and diuretic properties" { <i>Civil Surgzon D. Basi</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FOOD.<br>Seeds.                            | <i>Faridpore, Bengal</i> ).<br>Food.—Ainslie says the SEEDS of this species are eaten when young.<br><b>Ipomæa caerulea,</b> <i>Koen.;</i> Syn. for I. <i>heder&amp;cess/acg</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 875<br>376                                 | I. cymosa, X. & &/ FL Br. Ind., IV., 211.<br>Vern.—LAI da <sub>na</sub> h?, HIND.; Karmbi arak, SANTAL.; Cha'Aa kattu-tiva                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                            | viru malle, kappa-tiva, TEL.; Kiri-madu, SING.<br><b>References.</b> —Roxb., FL Ind. Ed. C.B.C., i63; Elliot, FL Andhr., 35, '9*,<br>Rev. A. Campbell, Report Ec. Prod. Chutia Nagpur, No. 9253; Trimen<br>Cat. Ceylon PL, 60.<br>Habitat.—A scandent plant frequent throughout India, except in the<br>drier areas, ascending to 4,000 feet. Seeds covered with brownish black                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MEDICINE.<br>Seeds.<br><b>377</b><br>FOOD. | hairs.<br>Medicine.—According to the <i>Pharmacopoeia of India</i> this may be one<br>of the species that yields the medicinal SEEDS known as <i>Shapussundo</i> , see<br>Ipomaea sp. ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Leaves.<br>37»<br>379                      | <ul> <li>Food.—The LEAVES are eaten by the Santals as a pot-herb.</li> <li>I. digitata, Linn.; FL Br. Ind., IV., 202.</li> <li>Syn.—I. PANICULATA, R. Br.; POMPEA GOSSYPIFOLIA, Willd.; CONVOL VULUS PANICULATUS, Linn.; Roxb, FL Ind./BATATAS PANICULATA</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                            | <ul> <li>Chois-</li> <li>Vern.—BUdikand, HIND.; Bilai-kand, bhúmi or bhúi-kumrd, BENG, Bhiii-hohala, BOMB.; Matta-pal-tiga, TEL.; Bhumichekrv-gadde, KAN. Phal-modecc MALAY J Viddri, bhumikashmdnda, SANS.</li> <li>References.— Roxb., Fl.Ind., Ed. C.B.C., 160; Dale. &amp; Gibs., Bomb FL, 167; Rheede, Hort. MaL, II., 101—102, t., 49; Ainslie, Met. Ind. II., 307; U. C. Dutt. Mat. Med. Hind., 205, 294,323; Dymock, Mat Med. W. Ind., 2nd Ed., 564; S- Arjun, Bomb. Drugs, 92; Year Bool Pharm., 1880', 249; Birdwood, Bontor, Pr. 57k Kew Off. Guide to Bol. Gardens and Arboretum, 27; Bombay (Kanara), XV., Guide to Bol. AgHHort. Soc. Ind. (Old Series), X., 20.</li> <li>Habitat.—A native of tropical India from Bengal and Assam to Cey lon, but found in the drier Western portion. Largely cultivated on account of its pink purple flowers, which appear.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br>Roots.<br><b>380</b>          | In the rains.<br>Medicine.—The large tuberous ROOTS are very much used in native<br>medicine, being regarded as tonic, alterative, aphrodisiac, demulcent, and<br>lactagogue. The powdered root-stock is given with wine, for the purpose of<br>increasing secretion of milk, and for the emaciation of children with debility<br>and want of digestive power, the early Sanskrit physicians prescribed a<br>diet of equal parts of <i>viddri</i> , wheat-flour, and barley ( <i>Dutt, I.e.</i> ). Rheedd<br>refers to the use of the powdered sun-dried root, boiled in sugar and butte<br>to promote obesity and moderate the menstrual discharge. Dymock say<br>that the tuberous roots are in considerable demand, being extensively used<br>in Bombay, and that the young tapering roots, of a small variety, are known<br>in the herbalists' shops as <i>asgand</i> . The name <i>asgand</i> is also, however<br>given to Withania coagulans, <i>Dunal</i> (see Vol. VI.), the roots of which are<br>twisted, white, covered with a thick soft bark and contain a good deal o<br>red-colouring matter, which is visible through the greyish epidermis. The<br>roots of the Ipomaea <i>(asgand)</i> are only half the length of those of With<br>ania, or about 6 to 8 inches long ; they are light yellowish brown externally<br>white internally, brittle, with a short and starchy fracture. They are muci<br>laginous and bitter in taste. According to the <i>Mokhzan-el-Ad-wiya</i> the<br>are tonic and alterative, and by Chakradatta are recommended to be giver<br>to weakly children. The Rev. J. Long says the powdered root in<br>used in spleen disease; it is purgative in its action. In Davies' Trade and<br><b>I. 380</b> |

| The Kele depek                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | POMiEA       |
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| The Kala-danah. [G. Watt.) he                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | deracea.     |
| Resources of the North-West Frontier frequent mention is made of <i>Asgand</i> .<br>SPECIAL OPINIONS.—§ "Much used as a lactagogue" ( <i>Assistant Surgeon Shib Chvnder Bhattacharji, Chanda, Central Provinces</i> ). <sup>15</sup> Cholagogue, useful in liver complaints" ( <i>J. N. Dey, Jeypore</i> ).<br>Fodder.—Stems and leaves eaten by cattle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FOPDER.      |
| <ul> <li>Ipomæa oriocarpa, Br.; Fl. Br. Ind., IV., 204; Wight., lc, t. i6g.</li> <li>Syn. —I. SESSILIFLORA, Roth.; CONVOLVULUS SPHGEROCEPHALUS, Roxb.;<br/>C. HISPIDUS, Wall.</li> <li>Vern.—Kalman, ASSAM; Haran-khúri, hara (BIJNOR), bhdnwar, NW.<br/>P.; Bhdnwar, PB.; Pwiti tige, TEL.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 158; Dalz. &amp; Gibs., Bomb.<br/>Fl., 166; Elliot, FL Andhr., 160; Rev. A. Campbell, Report Econ. Prod.,<br/>Chutia Nagpur, No. 8119; Atkinson, Econ. Prod. NW. P., V., 95;<br/>Gazetteers.—Mysore &amp; Coorg, I., 63; NW. P. {Bundelkhand), 1., 82;<br/>(Agra), /V., Ixxv.; Himalayan Districts, X., 3id; Journal Agri<br/>Hort. Soc. Ind. {Old Series}, XIII. (Sel.), 63.</li> <li>Habitat—Found throughout India up to altitudes of 4,000 feet; com-</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 382          |
| mon in Bengal and distributed to Ceylon, Afghanistan, &c.<br><b>Food.</b> —According to most writers this plant is eaten in times of<br>famine. Atkinson, however, says it "occurs wild in the plains and lower<br>hills and is sometimes sown with wheat. The leaves and stems are eaten<br>as a vegetable, and the leaves are used in medicine."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | FOOD.<br>383 |
| <ul> <li>I, hederaĉea, Jacq., Fl. Br. Ind., IV., 199.</li> <li>Syn.—1. CCERULRA, Koen.; Roxb., Fl. Ind.; I. PUNCTATA, Pers. / I. Nil. and I. BARBATA, Roth.; CONVOLVULUS NIL, Linn.; C. HEDERACBUS, Linn.; C. DILLENII, Lamk.; PMAKBITIS HEDERACEA and P. NIL, Chois.g P. DIVERSIFOLIA, Lindl.; P. VARIIFOLIA, Dene.</li> <li>Vein.—The seeds are officinal and are known as Kaldrdanah, tnirchai, HIND., BENG., and BOMB.; Nil-kalmi, BENG.; Baunra, NW. P.; Hub-ul-nil, KASHMIR; Bildi, ker, kirpdwa, phaprt sog, ishpecka, PB.; Hub-ul-nil, SiN∞.; Kdli-zirki zirki, DEC.; Kdld-ddnd, Guz.; Kodi, kdkkatdn-virai, jirki-virai, TAM.; Kolli-vittulu, TEL.; Ganribija, KAN.J Hab-un-nily ARAB.; Tukm-i-nil, PERS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 384          |
| <ul> <li>Dr. Moodeen Sheriff says the Deccan name Kali-zirki should be exclusively applied to the seeds of this plant, and that great ambiguity has been caused through Kdld ddnah, &amp;c, being applied to the seed of Clitora Ternatea, Linn, (which see). Dr. Dymock thinks it doubtful whether the Hindustani name Zirki is properly applied to I. hederacea. For Kdld-zira see Nigella sativa.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 168; Stewart, Pb. PI., x\$i t Mason, Burma and Its People, 783 J Elliot, FI. Andhr., 93f Pharm. Ind., rss; Waring in Jour. Pharm. Soc, VII., series 2, 408; Waring, Bazar Med., 75; O'Shaughnessy, Beng. Dispens., 50\$; Moodeen Sheriff, Supp. Pharm. Ind., 2nd Ed., 558 ; Flitck. &amp; Hanb., Phartnacog., 448 ; Bent. &amp; Trim., Med. PL, 185; S. Arjun, Bomb. Drugs, 95 ; Murray, PI. and Drugs Sind, 166; Med. Top. Ajmir, 144; Irvine, Mat. Med. Patna, 51; Baden Powell, Pb. Pr., 367; Atkinson, Him. Dist.3i4, 745; Drury, U. PL, 336; Lisboa, U. PL Bomb., 255; Bird-V)ood, Bomb. Pr., 57 / Home Dept. Official Corresp. regarding proposed new Pharmacopoeia, 227, 282, 319 ; Manual Cuddapak District, Madras, 200; Gazetteers :—Orissa I., 63; H., 159, 181; Mysore and Coorg, I., 63; Bundelkhand, 82 ; Agra, Ixxiv. ; Meerut, 82,</li> <li>Habitat.—A common plant, widely cultivated in India, but also apparently found wild.</li> <li>There are two varieties :—</li> </ul> |              |

a integrifolia: leaves entire.

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Syn.—I. COERULESCRNS, Roxb., FL Ind., Ed. C.B.C., 168.

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| IPOMiEA<br>bederacea                                                                                                                 | The Kala-danah.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| IPOMiEA<br>hederacea.<br>MEDICINE.<br>385<br>Šogās.<br>386<br>Extract.<br>387<br>Tincture.<br>388<br>Powder,<br>389<br>Resin.<br>390 | The Kala-danah.<br>• himalaica: leaves and flowers large, seeds densely closely villous.<br>Found at altitudes of 4,000 to 5,000 feet.<br>Medicine.—This drug does not appear to have been known to the<br>early Sanskrit physicians, and is not described by Ainslie. The author<br>of the Makhzan-ul-Adwiya says that it is a drastic purgative, useful in<br>the treatment of billous and phlegmatic humours, and that it acts also as<br>an anthelmintic. Roxburgh was apparently the first to make these SEEDS<br>known to European physicians, and it may be said they nowliold an im-<br>portant position as a useful and cheap substitute for jalap. They were<br>made officinal in the Pharm. India in 1868, where directions will be found<br>to make the preparations in which the drug is now administered, namely,<br>in the form of a TINCTURE, an EXTRACT, a compound POWDER, or a resin,<br>consequently on the place of the corresponding preparations of Jalap. The<br>resin (introduced by Dr. Bidie) appears to be the most satisfactory forr.<br>of administering the medicine; it does is 4 to 8 grains. This substance<br>is known as Pharbitisin. It has a nauseous acrid taste and an unpleasant<br>odour, especially when heated.<br>The abumen and mucilage are given, consequently the result of the opera-<br>tion is an enormous bulk of almost inert extract, which in a short time<br>becomes putrid. Five to ten grains of this extract have no perceptible<br>effect as a purgative." O'Shaughnessy says that it proved an<br>diffective purgative in 94, occasioned vomiting in 5, but in 15 it produced<br>on an average five stools within 28 hours and the action generally com-<br>menced in an hour's time. O'Shaughnessy adds that in his time the<br>seds sold at 4 seers per rupee. Dr. Kirkpatrick regards <i>kdld danass</i><br>intermediate in strength between rubarb and jalap. According to Irvine<br>the ativer sroast the seeds before reducing them to a powder.<br>SFECIAL OPINIONS.—§ " A certain and efficacious purgative. Dose<br>51" 55 of 5° powdered seed mixed with powdered ginger" ( <i>Assistant</i><br><i>Surgeon Shib Chundra Bhat</i> |
| 1                                                                                                                                    | pensary practice. Its action resembles very much that of jalap, the dose<br>being usually £i » (Civil Surgeon R. Macleod, Sarun). "Several native<br>I. 390                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| A Drastic Purgative. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IP <i>O¥EA</i><br>muricata                                         |
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| practitioners have told me of the value of * Kdlddna seeds <sup>9</sup> as an active<br>purgative, causing copious liquid stools, and as being very safe and effi-<br>cacious, but inadmissible in inflammatory states of the alimentary canal "<br><i>[Surgeon J. Ffrench Mullen, M.D., I.M.S., Saidpore).</i> " Quite equal<br>to jalap and in many respects superior to it. Very largely used in charit-<br>able dispensaries. The powdered seeds given in drachm doses" ( <i>Civil</i><br><i>Surgeon S. M. Shircore, Murshtdabad).</i> " Much used as an ordinary<br>purgative in dispensary practice, the usual dose of the powdered seeds being<br>half a drachm " ( <i>Surgeon G. Price, Shahabad).</i> " A cheap and certain pur-<br>gative. I constantly use it in jails" ( <i>Surgeon R. D. Murray, M.B., Burdwan).</i><br>" An excellent and sure purgative, operating quickly. The seeds reduced<br>to a powder are used as a substitute for jalap. Dose Ji with 5 grains of<br><i>pulvia singiberis</i> and a little sugar " ( <i>Civil Surgeon C. M. Russell, Sarun).</i><br>"The seeds of Ipomaea hederacea or the <i>Kdld-zirki-kebinj</i> of Madras and<br><i>Kdlddna</i> of Calcutta. They are undoubtedly one of the few good and<br>cheap cathartics India possesses, and also one of those purgatives which<br>act very efficiently and satisfactorily when used alone. In this respect<br><i>Kdlddna</i> is preferable to jalap. The simple powder is prepared by drying<br>the seeds well and reducing them to fine powder in the ordinary way.<br>Dose, from 45 grains to one drachm. The compound powder should be<br>prepared with cream of tartar in equal proportions as follows :—Take of<br><i>Kdldddna</i> and cream of tartar, in powder, each seven ounces; ginger,<br>in powder, one ounce; rub them well together and pass the compound<br>powder through a fine sieve. Dose from one drachm to a drachm and a<br>half" (Honorary Surgeon Moodeen Sheriff, Khan Bahadur, G.M.M.C.,<br>Triplicane Madrae) |                                                                    |
| Triplicane, Madras).<br>Chemistry.—For an account of the chemical nature of these seeds see<br>Flückiger and Hanbury*s Pharmacographia (reproduced in Dymock's<br>Materia Medica, Western India, 560),                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                    |
| Trade.—In Bombay the seeds of I. muricata, <i>Jacq.</i> (imported from Persia), are sold much more commonly than those of the true <i>kdld ddna {Dymock)</i> . Their action appears to be identical (see the account of that species below). Irvine remarks that in Patna the <i>kdld ddna</i> seeds sold at 2 annas a pound during his time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 392                                                                |
| pomaea muricata, Jacq., FL Br. Ind., IV., 197.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 393                                                                |
| Sy <sup>4</sup> —I. BONA-NOX, <i>Bot. Reg.;</i> CONVOLVULUS MURICATUS, <i>Linn.; CAT</i><br>LONYCTION MURICATUM, G. Don.; C. BONA-NOX, Chois., Var. MURICA<br>TA, Ckois. in DC. Prod.<br>Vem.—Bdrik bhauri (= lesser bhaurt), KONKAN; Gariya, BOMB.; Kalu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                                                                  |
| <ul> <li>dlanga, SING.; Tukin-i-nil, imported into Bombaj from PERSIA.</li> <li>References.—Roxb.% FL Ind., Ed. C.B.C., 167; Trimen, Cat. Ceylon PL 59; Graft., List Bomb. PL, No. 972; Dymock, Mat. Med. W. Ind., 2nd Ed., 561,562; Bent. &amp; Trim., Med. PL, 185; S. Arj'un, Bomb. Drugs, 219;</li> <li>Habitat.—Common in India, cultivated, and also apparently wild. In some of its forms it approaches so close as to be almost indistinguishable from certain conditions of I. hederacea, Jacq.; it is quite distinct from I bona-nox. It is said to occur on the Himalaya at altitudes of 1,000 to 5,000 feet, extending from Kangra to Sikkim.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>, |
| Medicine.—The SEEDS are used chiefly as a substitute for those of the preceding species, from which they can be distinguished by their large size, lighter colour, and thick testa. Dr. Dymock was the first to establish that the <i>Tukm-i-nil</i> imported from Persia was identical with this species. When exhausted, he writes, with rectified spirit, the Persian seeds jield brown resin and yellowish oil, having the same appearance as the resin and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | r Seeds.<br>h <b>394</b><br>a d                                    |
| oil of the genuine article. The medicinal properties of the Tukm-i-na                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                    |

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| IPOMiEA              | The Jalap Plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
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| <u>purga.</u>        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| MEDICINE.            | seem to be the same as that of the <i>Kaldddna</i> , but Dymock adds " accurate                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| Juice.<br><b>395</b> | observations are required." The JUICE of the plant is used to destroy bugs.<br>The value of the imported seed is said to be R5 per maund of 375ft in<br>Bombay.                                                                                                                                                                                                                                                                                                                                                                                      |  |
| food.<br><b>396</b>  | No information is available as to whether or not the seeds of the indi-<br>genous stock of I. muricata are utilised by the people of India.<br>Food.—Dymock refers to this species as one of the plants eaten m<br>times of famine.                                                                                                                                                                                                                                                                                                                  |  |
| 397                  | Ipomaea obscura, Ker.; Fl. &r. Ltd., IV., 207.<br>Syn.—I. INSUAVIS, BL; I. OCULARIS, Bartl.; CONVOLVULUS OBSCURUS,                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                      | Linn.<br>Vern.—Sirutali, TAM.; Tsinnataliaku, also nalla kokkita, TKL.JMaha-                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|                      | <ul> <li>mdduy SING.</li> <li>References. —Roxb., Fl Ind., Ed. C.B.C., 158; Dais. &amp; Gibs., Bomb. FL, 166; Wight, in Madras Journ., V., 6, t. 12; Ainslie, Mat. "Indica, II.» 394; Trimen, Cat. Ceylon PL 60; Drury, U. PL, 259; Mason, Burma. and Its People, 784; Elliot, FL Andhr., 125; Gazetteers—Bundelkhand, 82; Mysore &amp; Coorg, I., §6; Bombay {Kanara), XV., 439.</li> <li>' Habitat.—Fairly common throughout India, ascending to altitudes of 3,000 feet. The variety known as gemella is frequent in Bengal and Burma.</li> </ul> |  |
| MEDICINE.            | Medicine.—Ainslie appears to be the only writer who describes the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| Leaves.              | properties of this plant. He says "the LEAVES of this twining plant have                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 398                  | a pleasant smell and mucilaginous taste; when toasted, powdered, and<br>boiled with a certain portion of $zM_t$ they are considered as a valuable ap-<br>plication in aphthous affections."                                                                                                                                                                                                                                                                                                                                                          |  |
| 399                  | I. pes-tigridis, Linn.; Fl. Br. Ind., IV., 204; Wight, Ic., t. 836.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| 577                  | TIGER-FOOTED IPOALXA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|                      | Syn.—CONVOLVULUS PES-TIGRIDI, Spreng.; C. PALMATA, Mosnch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                      | <b>Vern.</b> — <i>Languli-latd</i> , BENG.; <i>Mekamu aduga</i> , TEL.J <i>Divi-adiya</i> , <i>divt-</i><br><i>pahuruy</i> SING.                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
| - :                  | References.—Roxb. <sub>1</sub> FL Ind. <sub>9</sub> Ed. C.B.C., 169: Elliot, FL Andhr., n4t<br>Mason, Burma & Its People, 437, 783; Gazetteers:—Bundelkhand, 82;<br>Agra, Ixxv. ; Himdlayan Districts, 314; Mysore & Coorg,/., 56 > Indian<br>Forester, XII., App. 17; Trim en, Cat. Ceylon PL, \$9; Rheede, Hort.<br>MaL, XI., 121, t. 59-                                                                                                                                                                                                          |  |
| ``                   | Habitat.—A very common species, throughout India from the PanjaD to Malacca and Ceylon. There are two varieties:—                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|                      | a hepaticifolia: leaves 3-lobed or angular. This is the most abund-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|                      | ant species in the Deccan Peninsula.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| MEDICINE.            | ft capitellata: leaves ovate, cordate, acute, entire. A common Ipomcea<br>from the Deccan to Behar and Hindustan proper.<br>Medicine.—Said to be used medicinally.                                                                                                                                                                                                                                                                                                                                                                                   |  |
| 400<br>401           | I. purga, <i>Hayne</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 401                  | JALAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|                      | Syn.—EXOGNONIUM PURGA, Benth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
|                      | <b>References.</b> —Year-Book, Pharm., 1874, 85; Kew Report, 1881, 49i Kew Off. Guide to the Mus. of Ec. Bot., 99.                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                      | Habitat.—A native of the Mexican Andes, occurring at altitudes between                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|                      | 5.000 and 8,000 feet above the sea. In the localities where it occurs rain<br>falls almost daily, and the diurnal temperature varies from 60° to 75° File.<br>It flourishes in shady woods in a deep rich vegetable soil.                                                                                                                                                                                                                                                                                                                            |  |
|                      | 10 is now being cultivated in Kurone and India , in the couth of Kng-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|                      | land it is said to grow freely if planted in sheltered borders, but its flowers<br>are produced so late in autumn, that they raiely expand, and the tubers,                                                                                                                                                                                                                                                                                                                                                                                          |  |
|                      | I. 401                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |

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| The Jalap Plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IPOMiEA<br>purga.     |
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| which develop in some abundance, are liable to be des<br>unless protected from frost ( <i>Pharmacographia</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | troyed in winter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |
| CULTIVATION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CULTIVA-              |
| NVV. PROVINCES.—About the beginning of the<br>Ainslie urged that the Government of India should ender<br>the jalap plant. In 1836, the same recommendation w<br>Royle ( <i>Trans. AgriHort. Soc. Ind.</i> , <i>III.</i> , 40), but appare<br>tempt at its cultivation was not made jintil in 1854. Dr.<br>intendent of the Botanic Gardens, Saharanpur, in that y<br>"Through the kindness of Dr. Royle I have been able to in<br>the Himalaya, where it is now growing with great vigour<br>there will be a sufficient quantity of roots to supply this y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | avour to cultivate<br>vas made by Dr.<br>ently the first at-<br>Jameson, Super-<br>year reported :—<br>itroduce jalap into<br>c. In a few years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                     |
| there will be a sufficient quantity of roots to supply this v<br>to tiie public service. It grows well at altitudes betw<br>feet." Commenting on that report Mr. J. F Duthle in<br>that " this experiment did not lead to any practical res-<br>mention was made by Dr. Jameson regarding the cultiva<br>In 1884, 300 small tubers weighing 5 to 6lb were receiv-<br>mund for cultivation in the Arnigadh garden, and from t<br>increased to 640ft. The plant grows with great vigour<br>the root growth, Mr. Go)Ian thinks, would be all the<br>growth were less vigorous. As the Bengal medical<br>all 2,000ft of the dried root annually, and only 640ft har<br>during four years, I fear it will take sometime before the<br>sition to supply the full amount. Mr. Gollan tells me t<br>five-sixths of their weight in drying, so that in order to<br>dried tubers no less than 12,000ft of green tubers would<br>to keep up a steady annual supply of 2,000ft, 36,000<br>should be in hand before commencing to supply thedru<br>MADRAS.—In a foot-note to page 443 of the <i>Pharma</i><br>ger and Hanbury say that on the 15th January 1870 tf<br>Mr. Broughton, of the Nilghiri Hills, a cluster of tubers<br>9ft. It would thus appear that jalap cultivation was<br>Madras Presidency prior to that date. Mr. Jamieso<br>Annual Report of the Botanic Gardens and Park o<br>1879-80, states:—'-The propagation of jalap was start<br>mund gardens in 1877. Our stock then consisted of 1<br>been grown in the gardens for ornament. Although t<br>to a large size and the stems grow luxuriantly and fl<br>flowers do not fertilize freely, and produce but few seed<br>Ootacamund, consequently the increase of the plant<br>almost entirely to propagation from root and stem cu<br>has been carried on steadily until there are now upwat<br>and root cuttings permanently planted out. The tubers<br>ed 4 x 4 feet apart, but it was found that they did no<br>and thrive equally well when planted closer. They<br>planted in rows three feet apart and the distance betw<br>the row does not exceed two feet, so that 25,000 plant<br>planted of five acres. The cost of cultivation, weeding<br>reduced by close planting." -<br>Met | valuable medicine<br>reen 4,000 to 4,500<br>forms the author<br>sult, as no further<br>ation of the plant.<br>wed from Ootacai<br>these the crop has<br>at Arnigadh; but<br>better if the vine<br>depdts require in<br>ve been produced<br>garden is in a po-<br>hat the tubers lose<br>prepare 2,000ft of<br>be required; and<br>ft of green tubers<br>g."<br><i>cographia</i> , Flttcki-<br>hey received from<br>s of jalap weighing<br>commenced in the<br>n, however, in hi<br>f the Nilghiris for<br>ed in the Ootaca<br>00 plants that had<br>he tubers increas<br>ower profusely, th<br>s in the climate o<br>has been confine<br>ttings. This worl<br>rds of 25,000 plant<br>were at first plant<br>t exhaust the land<br>are, therefore, now<br>yeen each plant i<br>s give a total are<br>g, &c, is also muc | Madras.<br>403<br>403 |

of situation of good potatoes seem equally necessary to the growth of jalap; good grass land is preferable to open rich forest land; when

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| IPOMiEA 1 The John Plant                          |                                                                                                                                                        |
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| IPOMiEA<br>purga.<br>CultīvA-<br>īlon.<br>Madras. | The Jalap Plant.                                                                                                                                       |
| _                                                 | Mr. M. A. Laws on, Government Botanist and Director of <b>Chinchona</b><br>Plantations, Nilghiris, has favoured the author with the following sfuecial |
| -                                                 | I. 403                                                                                                                                                 |

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| The Red Jasmine. (G. Watt)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IPOMiEA<br>sepiaria.                   |
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| report, which brings the facts of Madras cultivation down to the present<br>date :—" The true jalap (Ipomaeapurga) grows extremely well on these hills,<br>especially in peaty soil. The tubers in four or five years' time, weigh, when<br>first taken up, from five to ten pounds, and upon analysis are found to be<br>as rich in the purgative resins, as the best kinds imported from South<br>America. I only know of one person who has attempted to grow them on<br>any large scale, and he has not been very successful. The Government of<br>Madras ordered the re-cultivation of the jalap in these gardens two years<br>ago, and about one acre has been planted with the tubers, which in<br>another two years' time will yield probably some thousands of pounds of<br>the drug, and if the cultivation of them is found profitable it is hoped that<br>planters will be induced to give it another trial."<br>BENGAL.—The Superintendent of the Royal Botanic Gardens, Cal- | CULTIVA-<br>TION.<br>Madras<br>Bengal. |
| cutta, reports that the cultivation of the jalap plant in Bengal was not successful.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 404                                    |
| Ipomaea Quamodit, Linn.; Fl. Br. Ind., IV., 199.<br>RED JASMINE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 405                                    |
| <ul> <li>Syn.—CONVOLVULUS PENNATUS, Lamk.; C. QUAMOCLIT, Spreng.; QUA-MOCLIT VULGARIS, Ckois,</li> <li>Vern.—Taru latd, Idl or swetd, kdmlatd, or Idl or sweta turu<sup>*</sup> laid, BENG. ≯</li> <li>Vishnukrant, MAR.; Kdmlatd, HIND.; Tsjuria-cranti, MAL. (In Rheede, Hort. Mal., XI., 123, t. 60); Myatlace-ni, BURM.; Kdmalata, tarudatd (Cupid's flower), SANS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                        |
| References.—Roxb., FL Ind., Ed. C.B.C., 169; Sir W. Jones, V., 88,<br>No. 20; Dymock, Mat. Med. W. Ind., 2nd \Ed., 561; U. C. Dutt, Mat*<br>Med. Hind., 302; Mason, Burma and Its People, 438, y83; Jour.Agrir<br>Hort. Soc. Ind. {New Series}, IV., 94 i Rumph., Amb., V'., 155, t. 2.<br>Habitat.— Roxburgh regarded this species as a native of various parts<br>of India, but the Flora of British India gives it as "common throughout<br>India, in gardens and as a denizen; native of tropical America." There<br>are two varieties of the plant met with in gardens—red and white flowered;<br>the former only occurs wild or ? acclimatised.<br>Medicine.—'1 he Hindús consider it to have cooling properties. The<br>pounded leaves are, for example, applied to bleeding piles, while a prepara-                                                                                                                                                                                | 4                                      |
| tion of the juice with hot ghi is administered internally. Dr. Dymock says that in Bombay the leaves are used as a Up for carbuncles (Kdlptuli).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                        |
| <ul> <li>I, reniformis, Chois.; Fl. Br. Ind., IV., 206.</li> <li>SynCONVOLVULUS RENIFORMIS, Roxb.; EVOLVULUS EMARGINATUS, Burnt.; IPOM^A CYMBALARIA,FengL</li> <li>VernUndirkdni, BOMB.; Perretay kiray, TAM.; Toinuatali, TEL.</li> <li>ReferencesRoxb., Ft. Ind., Ed. C.B.C., 161; List of Drugs contributed Calcutta Inter. Exhib. by Baroda Durbar, No. 118; Dymock, Mat. Med. W. Ind., 2nd Ed., 566; S. Arjun, Bomb. Drugs, 94; Lisboa, U. PL Bomb., 202; Indian Forester, III., 237; Gazetteer, Banda, 82.</li> <li>HabitatA procumbent plant with reniform leaves and small yellow flowers; common in the hotter parts of India in damp places, extending northwards to Behar and Rajputana and westwards to the Deccan Peninsula. It ascends the hills to altitudes of 3,000 feet above the sea.</li> </ul>                                                                                                                                                                        | 407                                    |
| Medicine.—The plant is described as deobstruent and diuretic (Sa»<br>kharam Arjun). Dymock remarks that the Hindus administer the juice<br>in rat-bite, and drop it into the ear to cure sores in that organ.<br>Food.—Used as a pot-herb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MEDICINE.<br>Juice.<br><b>403</b>      |
| I. sepiaria, Keen.; Fl. Br. Ind., IV., 20g.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FOOD.                                  |
| Syn.— IPOMIEA STRIATA, Roth.; I. HEYNH, Wall.; CONVOLVULUS MAXI-<br>MUS AND STRIATUS, VahL; C. MARGINATUS, Lamk.; C. SEPIARIUS and<br>INCRASSATUS, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 410                                    |
| · 1. 410                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | •                                      |

## Dictionary of the Economic

| IPOMJEA<br>sp.    | The Shapusundo or Lal-dana.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                   | Vern.—Ban kalmi, BENG.; Thali kirai, 'IAM.; Metta t&ti, puriti tigc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ·                 | TEL.; Tim-tali, MAL.; Rasa-tel-kola, SING.<br><b>References.</b> —Roxb., FLInd., Ed. C.B.C., 168; Rev.J. Long in Agri,<br>Hort. Soc. Ind. Journ., X., 21; Dale. & Gibs., Bomb. Fl., 166; Elhav<br>Fl. Andhr.y rig; Gazetteers :—Bomhay, III., 203; Mysore & Coorg,J.><br>63; Banda, 82; Indian Forester, III., 237; Tritnen, Cat. Ceylon PI**<br>60; Lisboa, U. PI. Bomb., 202.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   | <b>Habitat.</b> —A species frequently met with throughout India to <sup>A</sup> Malacca<br>Ceylon, &c. The variety- <b>stipulacea</b> — (= <b>Convolvulus stipulaceus</b> , <i>Roxb.</i> )<br>occurs in Chittagong.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MEDICINE.         | <b>Medicine.</b> —According to the <i>Pharmacopeia of India,th\s</i> is presumed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4 "               | to be one of the species that yield the seeds known as <i>Shapussundo:</i> see <b>Ipomcea sp.</b> ? It seems more than likely, however, that <i>Ldl danahis</i> <b>not</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| FOOD &<br>FODDER. | as generally affirmed, synonymous with <i>Shapussundo</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 412               | Food and Fodder.—Eaten as a pot-herb and given as fodder to cattle Ipomaea sp.?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 413               | Vern.—Shapussundo, and by some also Lai danah.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | <b>References.</b> —K. L. De, Indigenous Drugs of India, 86; Pharm. Ind.,J57.<br>Drury, U. PI. Ind., 337; Home Department Official Correspondence<br>regarding a New Edition of Pharm. Ind. / Memo, by K.L. De, No. <b>14</b> '                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Lai- Dana.<br>414 | Habitat.—Although dried specimens of this plant do not appear to have<br>been submitted to any botanical authority for determination, Dr. De<br>affirms that it "grows abundantly in the Upper Provinces," and he adds<br>"When cultivated in Bengal, it grows equally well. The seeds are sola<br>in large quantities in Patna and other markets of the Upper $P^{rovm_Ae}T$<br>Each capsule contains three seeds of a brownish-red colour, and studaea<br>with minute hairs. When soaked in water, they swell and yield a muci-<br>iage. The seeds are to be dried in the sun previous to being $P^{ow}?^{ere}T$<br>The above passage practically contains all we know regarding the<br>identification of these seeds. Waring, in the <i>Pharmacopoeia</i> , $erre?$<br>them to Ipomaea, apparently on the assumption that they were $id_Antlgre$<br>with the <i>lal-dana</i> of Mr. T. O. Lahory, but he does not inform us whether<br>or not he personally examined either or both of these seeds. If the plan<br>that yields the so-called <i>shapussundo</i> be as plentiful as Dr. De wou<br>lead us to suppose, it is remarkable that it has never been botanicai<br>determined. Numerous writers refer to it, but perhaps repeat in $d??$<br>sentences only the statements originally published by De, so that during<br>the past twenty years nothing further has been made known than is con-<br>tained in De's <i>Indigenous Drugs of India</i> . |
| ~                 | The remark that the capsule contained only three seeds would (assume<br>ing that it is an Ipomaea, of which the writer has some doubts) a-sis-<br>it to the sub-genus Pharbitis, whereas Waring presumed shapussundo)<br>be the seeds of Ipomaea cymosa, R. fef S., and I. sepiaria, Kan., "wnich<br>have their seeds covered with short brown hairs," but these species do not<br>belong to Pharbitis. Turning to works on Economic Botany, however, to<br>discover references to shapussundo, Roxburgh {Fl. Ind., Ed. C.B-C, o <sup>•</sup> l><br>is found to assign the name shah-pusund to Amberboa (Centaurea) mos<br>chata, DC, Prod., VI., 560. and Voigt (Hort. Sub., Cal, 424) repeats this<br>as sapusuvd (the Sweet Sultan). Baden Powell (Panjdb Products, 355<br>& 386) adds to shahpasand the name of Idl ddna as the vernacular of<br>Centaurea moschata, and refers these to the same position with Centaurea<br>Benen, Linn {DC, Prod., VI., 567}, which he describes as a mild purga<br>tive root imported into India from Kabul. Stewart gives the name<br>*'''pia»p to Withania coagulans and asgand to W. somnifera. Dymock<br>while discussing the properties of Centaurea Behen, remarks "Ainslie<br>I. 414                                                                                                                                                                                                                            |

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| The Turneth Root or Indian Jalan. $(f Watt)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | rpethum.               |
| confounds it with asqand,* and also with the root of Physalis (Withania)<br>somnifera'' (Cotif. with Mat. Ind, //., 14). The writer has read through<br>Ainslie's account, and is of opinion that he is there describing, as he<br>affirms, Withania somnifera, which Dymock himself admits is the true<br>asgand, though the tubers of an Ipomaea imported into Bombay from Persia<br>are also sold in the bazars as asgand. (See the information given under<br>I. digitate above.)<br>It will thus be observed that much confusion exists regarding shapus-<br>sundo, and were it not that the seeds of neither Amberboa nor Centaurea<br>would answer to De's description, the writer would be much more dis-<br>posed to transfer that drug to either of these genera than to leave it in<br>Ipomsea. It is curious, however, that shapussundo, asgand (Ipomaea),<br>asgand (Withania), and Centaurea Behen—mild aperient drugs—should be<br>so much confused one with the other, and that Amberboa moschata should<br>at the same time be the only plant of the lot that can be said to be met<br>with on the plains of India, though of course under cultivation only, still<br>further that Withania should be the only indigenous Indian plant of the<br>series. Irvine, in his Materia Medico, of Patna, does not allude to ska-<br>pus nun do, though De specially mentions that city as the market where it<br>is chiefly obtained                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| is chiefly obtained.<br>[pomaea Turpethum, Br.; Fl. Br. Ind,, IV., 212.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 415                    |
| <ul> <li>TURPETH ROOT or INDIAN JALAP.</li> <li>Syn.—CONVOLVULUS TURPETHUM, Linn.; Roxb.; Wight; Hassk.;<br/>C. ANCEPS, Linn.; C. TRIQUETER, Vahl.; I. ANCEPS, R. &amp; S.; Bl.;<br/>Chois.; I. TRIQUETRA, R. &amp; S.; SPIRANTHERA TURPETHUM, Bojer;<br/>OFERCULINA TURPETHUM, Manso.</li> <li>Vern.—Nisoth, tarbud, nukpatar, pitohri, HIND.; Teori, dkud kalnti (or<br/>ditdiya-kalmi), BENG.; Bana etka, SANTAL; Chita bansa (the root in<br/>bazars, turbud, nisot), PB.; Nhhotar, phtitkari, BOMB.; Nishottara,<br/>MAK.; Nashotar, or nakotara, Guz.; likuri, DEC.; Shivadai, TAM.;<br/>Telia tégada, tégada, TEL.; Bilitigadu, KAN.; Trasta-wdlu, SING.;<br/>Trivrit, tripud, SANS.; Turbund, ARAB.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 160; Kuvz, For. Fl. Burnt.,<br/>II., 218; Thwaites, En. Ceylon PL, 212; Dale. &amp; Gibs., Bomb. Fl., 165;<br/>Stewart, Pb. PL, 750; Trimen, Cat. Ceylon PL, 60; Mason, Burma and<br/>Its People, 784; Elliot, Fl. Andkr., 174, 179; Rev. A. Campbell, Report<br/>Econ. trod. Chutia Nagpur, No. 9242; Pharm. Ind., 156; Ainslie, Mat.<br/>Ind., II., 382; (TShaughnessy, Beng, Dispens., 504; Moodeen Sheriff,<br/>Sitpp. Pharm. Ind., 34*; U. C. Dut, Mat. Med. Hind., 2u3, 321; Dy-<br/>mock, Mat. Med. W. Ind., 2nd Ed., 556; De, Indigenous Drugs India,<br/>64; S. Arjun, Bomb. Drugs, 94; Year-Book, Pharm., 1880,249; Irvine,<br/>Mat. Med. Patna, 116; Home Dept. Official Corresp. regarding pro-<br/>posed New Pharm. Ind., 238; Baden Powell, Pb. Pr., 367; Atkinson,<br/>Him. Dist.,314; Drury, U. PL, 259; Lisboa, U. PL Bomb, 2SS, 353;<br/>Birdwood, Bomb. Pr., 58; Davies, Trade and Resources of NW. Fron-<br/>tier (exports from Nurpur &amp; Kullu to Leh &amp; Yarkand), App. ccxi;<br/>Gazetteers:—Orissa, II., 160; Mysore and Coorg, I., 56; Kanara, 439;<br/>Ban da, h2; Agra, Ixv.</li> <li>Habitat.— Found throughout India, ascending to altitudes of 3,000 feet.</li> <li>Distributed to Ceylon, South-East Asia, Malaya, Australia, &amp;c.<br/>Cultivated occasionally in gardens as an ornamental plant; it grows<br/>well, for example, in the Botanic Gardens, Calcutta. The supply for</li> </ul> |                        |
| medical purposes is, however, derived entirely from the wild plant. The<br>Surgeon General, Bombay, reports that the plant is extremely cheap,<br>selling at R7 a cwt.<br>MedicineDutt {Hindu Materia Medico) says of this drug: "Two<br>varieties of trivrit are described by most writers, namely, sveta or white,<br>* He was probably mi&led by the Tuhfat which gives asgand as Hindi for "white                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | medicini<br><b>416</b> |
| Behen." I 416                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                      |

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| <b>IPOMiEA</b><br>Turpethu |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| Turpethun<br>MEDICINE.     | m. The Further Root of mean shap. m. The Further Root of mean shap. and krishna or black. The white variety is preferred for medical use as a moderate or mild cathartic. The black variety is said to be a powerful drastic and to cause vomiting, faintness, and giddiness. <i>Trivit</i> has been used as a purgative from time immemorial and is still used as such by native practitioners, alone, as well as in various combinations. In fact this medicine is the ordinary cathartic in use amongst natives, just as Jalap is among Europeans. The usual mode of administering it is as follows. About two scruples of the root are rubbed into a pulp with water'and taken with the addition of rock salt and ginger or sugar and black pepper. Roxburgh wrote in his <i>Flora Indica</i> of this drug that "the bark of the root is by natives employed as a purgative, which they use it fresh, rubbed up with milk. About six inches in length of a root as thick as the little finger they reckon a common dose." In a separate and more recent note on this subject he says, quoting Dr. Gordon : "The drug which this plant yields is so excellent a substitute for jalap, and deserves so much the attention of practitioners, that I doubt not the following account will prove acceptable. It is a native of all parts of continental and probably of insular India.also, as it is said to be found in the Society and Friendly Isles and the New Hebrides. It thrives best in moist shady places on the sides of ditches, sending forth long, climbing, quadrangular stems, which in the rains are covered with abundance of large white, bell-shaped flowers. Both root and when fresh contain a milky juice which quickly hardens into a resinous substance, altogether soluble in spirits of wine. The milk has a taste at first sweetish, afterwards slightly acid; the dried root has accredy any perceptible taste or smell. It abounds in woody fibres, which, however, separate from the more resinous substance in pounding, and ought to be row the root that all the purgative matter exis |
|                            | <i>prakdsa</i> and <i>Rdjanighantu</i> ,* may be found many synonyms for this<br>• These Mr Colebroke mentions as amongst the best writings of the Hindus on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

<sup>•</sup> These Mr Colebroke mentions as amongst the best writings of the Hindus on Materia Medica.

<sup>1. 416</sup> 

The Turpeth Root or Indian Jalap.

plant; in the last of these the root in question, *teori* (BENG.), is recommended as of use in removing worms and phlegm." •' Our present article," he continues, "had long a place in the British Matena Medica (Convolvulus indicus, Alatus maximus), but of late years it has fallen into disuse. I find it mentioned by Avicenna (264) under the name OJ y > turbad; but the first amongst the Arabs who prescribed it was Mesue, who gave the root, in powder, to the extent of from Ji <sup>to</sup> 5"» <sup>an(\*)</sup> of the decoction, from 5ii <sup>fo</sup> 5<sup>\*</sup>» Alston, in his *Materia Medica* (Vol. II, 530), speaks of *turbith* as a strong and resinous cathartic, and recommended in his days in gout, dropsy, and leprosy. The plant is known to the modern Greeks by the name of *TovpireQ.*" "Virey speaks of the root of the Convolvulus Turpethum as more drastic than the common Jalap." Muhammadan physicians recognise, like the Hindus, two forms of *turbad*, a white and a black, and recommend that the black should be avoided on account of its poisonous properties.

In India the usage of this drug, apparently, fell off after the appearance of O'Shaughnessy's Bengal Dispensatory, where he wrote, while commenting on the facts published in Roxburgh's Flora of India, "we have also subjected its properties to careful clinical experiment, and we feel warranted in asserting that the action of the medicine is so extremely uncertain that it does not deserve a place in our Pharmacopoeia." That verdict was reproduced in Waring's Pharmacopceia of India, and European interest in the drug, from the date of that work, may be said to have died out. It will, however, be found (from the selection of special opinions quoted below) that native practitioners continue strongly in favour of it, and that Dr. Moodeen Sheriff and others think that the adverse opinion held by European authorities is largely due to the whole root having been used instead of the root-bark. In this opinion Me rat and DeLens concur, recommending that the roots should be chosen in which the bark is intact, " as most of the activity of the root resides in that part."

Chemistry.-The bark is without odour and has little taste. " Examined by M. Bontron Char land, it was found to contain resin, a fatty substance, volatile oil, albumen, starch, a yellow colouring matter, lignin, salts, and oxide of iron. The root contains 10 per cent, of resin (*M.* Andouard). According to M. Spirgatis, this resin is a glucoside, turpethin, C<sub>36</sub> H<sub>6</sub>g O<sub>16</sub>, like that of other CONVOLVULACE^E, insoluble in ether, but soluble in alcohol, to which it imparts a brown colour not removable by animal charcoal. To obtain it pure the alcoholic solution is concentrated; the resin precipitated by water, boiled with this vehicle, then dried, reduced to powder, digested with ether, and finally redissolved by absolute alcohol, and thrown down by ether." "It is inflammable, burning with a smoky flame, and emitting irritant vapours" (United States Disfensatory, 15th Ed., 1770). Accordingly Spirgatis turpethin is only present in the root to the extent of 4 per cent. Under the action of alkaline bases it is transformed into turpethic acid ( $C_{34}$  H<sup>A</sup>  $O_{18}$ ), and by hydrochloric and other dilute acids it is decomposed into *turpetholic* acid ( $C_{16}$  H<sub>32</sub> O<sub>4</sub>) and glucose. (Watts, Chemistry, V., 925-Q26). According to Dr. Dymock the FLOWERS are in Western India applied to the head in hemicrania.

SPECIAL OPINIONS.—§" My experience of the root of Ipomaea Turpethum is much greater now than nineteen years ago, when I spoke ot it in the *Supplement to the Pharm. of India*, pages 346—348. There are two varieties of it which are well known in the bazar as *sufed-turbud*, and *kala-turbud*, or, the white and the black *turpeth* root, respectively. The drug consists of pieces of root and root-bark, and the latter being the best and not generally sold separately in the bazar, requires to be picked

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Chemistry. 417

> Flowers, 418

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(G. Watt.) Turpethum <

I. 418

| IRIS.         | The Turpeth Root or Indian Jalap.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| ODDER.<br>41Q | 2 to 4 inches, and in thickness from one quarter to one inch; quilled or<br>curved; smooth, but often wrinkled longitudinally; taste slightly acrid,<br>and odour agreeable if new. The colour of the white variety is grey or<br>reddish-grey; and of the black, brown. The cut ends of the piece, parti-<br>cularly in the white variety, are often covered with some resinous sub-<br>stance. The thickness of the bark itself is about a line or two, and the<br>bark of the white variety is generally thicker than that of the Wack.<br>The <i>turpeth</i> root, notably the white variety of it, is quite equal to jalap<br>and superior to <i>rhubarb</i> in its action, and preferable to both for having no<br>nauseous smell or taste, and for being a very efficient and satisfactory<br>purgative when used alone. Its dose is somewhat larger than that of<br>jalap, but this is no disadvantage, as long as it is safe and free from nauseous<br>taste and smell. The dose is larger only by 10 or 15 grains/ As a<br>cathartic and laxative, the <i>turpeth</i> root is useful in all the affections in<br>which either jalap or rhubarb is indicated. The best way of administer-<br>ing it is in simple powder; but it may also be employed in combination:<br>with cream of tartar in euqal proportion, and with or without a few<br>grains of ginger in each drachm of the compound powder. Dose "whe<br>simple powder is, from fifty to seventy grains, and of the compound powder<br>from a drachm to nintey grains" (Honorary Surgeon Moodeen Sheriff<br>Khan Bahadur, G. M. M. C, Triplicane, Madras). "What is sold as<br>black turband has the same structure as the white, but it is of smaller size<br>and darker colour "[Surgeon-Major Dymock, Bombay]. "Used as a pur-<br>gative by native practitioners" (Civil Surgeon, Ahmedabad). "" are jegs<br>powdered in doses of a drachm and a half is used as a purgative, but 1s<br>efficient than kaládána" (1st Class Hospital Asst. Lai Mahomed, $M < \frac{1}{10}$<br>Dispensary^ Hoshangabad, Central Provinces). |
| ACRED.<br>420 | many of the other species of Ipomaea.<br>Sacred.—The Hindus offer the flowers to Shiva.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 421           | Ipomsa vitifolia, Sweet.; Fl. Br. Ind., IV., 213.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| EDICINE.      | <b>FULL ON VOLVULUS</b> , VITIFOLIUS, Linn. / C. ANGULARIS, Linn.; IPOMÆA<br>ANGULARIS, Chois.<br>Vern.—Nawal, BOMB<: K>*'hin'ka'lae-n>way, BURM.<br>References.—Roxb., Fl. Ind., E*- C-B., C, 60; Da\z. and Gibs., Bomb.<br>Fl., 165; Kurs, For. Fl. B'', I'', I''' '9i T*TM«ites, En. Ceylon PL, A*;<br>Voigt, Hort. Sub. Cal., <sup>36]</sup> ' *ndian Forester, II., 26; Dymock, Mat.<br>Gatt^ers' kanfa''' Jour, H', H or U Sociandi (Old Series), VI., W/<br>f Ht^1**_Met with throughout /nd ia Texcept the dry North West) and<br>from bikkim to Assam, Chittagong, and Burma. Distributed to Ceylon,<br>Malacca, Malay Islands, &c.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Juiee.<br>422 | MedicineDymock says the JUICE is in the Koncan considered cooling<br>and is given with milk and sugar. A $Up$ is prepared; consisting of the<br>juice, with lime juice, opium, and Coptis Teeta, which is applied around<br>the orbit of the eye in inflammation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| •             | <b>IRIS</b> , Linn.; Gen. PI., III., 686.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|               | verv <sup>AW</sup> <sup>AnOn</sup> ii <sup>C</sup> information regarding the various species of Indian Irfsfs<br>ffid mayhs <sup>AA</sup> T! <sup>18</sup> P <sup>robal</sup> >lethat a re-arrangement of the facts here pub-<br>referred to fc <sup>···</sup> A <sup>ke</sup> P <sup>Ia</sup> <sup>11</sup> * <sup>hen</sup> the bazar products have been more definitely<br>E <sup>A</sup> acceV ted $ZS^{Tb}$ <sup>WIV</sup> <sup>Ththe</sup> belong. <sup>A</sup> This enumeration may, therefor <sup>*</sup> .<br>San as olacTnJ-HA <sup>MAD</sup> 5 <sup>the names of the Indian</sup> wild and cultivated species<br>nan as placing on record a satisfactory statement of each individual. There<br>I-422                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

The Iris, Orris Root.

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| would appear to be some six or seven indigenous species: within Quetta three addi-<br>tional forms, and in Afghanistan <i>some</i> four or fiv6 more. In Davies' Trade and<br>Resources of the North-West Frontier <i>Iris</i> and <i>Kut</i> (Saussurea Lappa) are<br>confused together.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
| Irisensata, Thunb.; Jour. Linn. Soc. <sup>^</sup> XVI., 139; IRIDE«.<br>Syn I. MOORCROFTIANA, Wall.<br>Vern.—Irisa, sosun, HIND.; Tesma, BUOTE; Krishlin, 'unarjal, marjal,<br>KASHMIR; Begbunuphsha, PURS.<br>References.— Stewart, Pb. PI., 240; Boissier, Fl. Orient., V., 127; Med.<br>Top. Ajmir, 129.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 423                       |
| Habitat.—Common on the temperate North-West Himalaya and Kash-<br>mir, in damp places, often grown in gardens.<br>Fodder.—§ '' The LEAVES are largely collected and employed as fodder<br>and bedding for cattle, for thatching, matting, and basket-work in<br>Ladak '' (Surgeon-Major J. E. T. Aitchison, Simla).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | FODDER.<br>Leaves.<br>424 |
| <ul> <li>I. florentina, Linn.; Jour. Soc. Linn., XVI., 146.</li> <li>THE IRIS, ORRIS ROOT.</li> <li>Vern.—Irsa, sosun, HIND.; Bekh sosan, ersd, KASHMIR; Irisa, PB.; Bekh-<br/>i-banfsa, PERS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 425                       |
| <ul> <li>"References.—Stewart, Pb. PI., 240; Boissier, Fl. Or., V., 137; Ainslie,<br/>Mat. Ind., I., 182, 284; Bent. &amp; Trim., Med. PI., 273; S. Arjun, Bomb.<br/>Drugs, 142; Murray, PI. and Drugs, Sind, 19; Irvine, Mat. Med.,<br/>Patna, 10; Med. Top. Ajmir, 129; Year-Book, Pharnt., 1873, *'4&gt;<br/>Birdwood, Bomb. Pr., 89.</li> <li>Habitat.—This is the European plant so much used in the preparation<br/>of the sweetly-seen ted Otto of Orris. It is said to be sometimes met with<br/>in Indian gardens. In Kashmir this, as also several other species, are<br/>cultivated, and either wild or only acclimatised are frequently seen on<br/>the margins of fields near water. The writer collected what appears to be<br/>this species in Pangf. It is fairly plentiful in the Simla district and in<br/>Kullu, but always under circumstances that would lead to the suspicion<br/>of its being cultivated or at most only an escape from cultivation. This<br/>may probably be the Iris longifolia mentioned by Adams (Wanderings of<br/>a Naturalist, p. 196) as seen by him on the Northern P'injal, though it<br/>would seem that I. pallida is in many parts of the Himálaya also accli-<br/>matised and may possibly be the shrúl or skecho of Stewart's Panjdb<br/>Plants.</li> </ul> |                           |
| Perfumery.—It is not known whether the natives of India employ the tubers of any Iris in perfumery. But it is significant that while in the <i>Ain-i-Akban</i> a special chapter is devoted to Perfumes, no mention should be made of Orris. Presumably the perfume prepared from these rhizomes in Europe was not known to the Muhammadans of India 300 years ago. ( <i>Conf. with Piesse, Art of Perfumery, 172-174.</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | perfumery.<br>426         |
| Medicine.—There seems considerable doubt as to the identification of<br>the <i>irisa</i> root; in fact, it is not by any means proved to be obtained from<br>this species. Stewart says <i>irisa</i> is used externally in the treatment of<br>rheumatism. Irvine mentions that it comes to India from Kabul. But<br>I. germanica is cultivated in Kashmir and is more probably the source of<br>the drug mentioned by Stewart than is I. florentina*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MEDICINE.<br>427          |
| I. germanica, Linn.; Jour. Linn. Soc., XVI.> 146.<br>Syn.—I. DBFLEXA, Knowles and Westc.; I. NEPALKNSIS, Wall., in Lindl.<br>Bot. Reg., t. 818, von Don; I. VIOLACEA, Savi.<br>Vern.—Bikh-i-banafshah, PKRS.; Irsd, ARAB.; Keore-kd-mul, HIND. &<br>BOMB.<br>BomB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 423                       |
| References.—Dymock, Mat. Med. W.Ind., 2nd Ed., 793-794; Boissier,<br>Fl. Or., V.9 139.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |

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| 490                                                                      | Dictionary of the Economic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IRIS;<br>'Morea.                                                         | The Nil Kamal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MEDICINE.<br>Root.<br>429                                                | Medicine.—" Orris root is not mentioned by the old Hindu physicians<br>Muhammadan writers mention several kinds of Iris under the names of<br><i>Irsd</i> and <i>Susán</i> , but their descriptions are not sufficiently accurate the<br>enable us to identify them with any certainty. From Mir Muhammaa<br>Husain's account ( <i>Con/. Makhean</i> , article 'Susán'), I conclude tha<br>both the Iris fcetidissma, <i>L.</i> , the ( <i>vpis</i> of Dioscorides and I. P? <sup>c.ud&lt;</sup> }f.<br>corns, <i>L.</i> , the <i>vepdKpivos</i> of the modern Greeks, are used medicinally<br>in Persia. The correct Persian for I. germanica appears to*be <i>Susan-ti</i><br><i>dsmdnjúni</i> . The word <i>Susan</i> is said to be derived from the Syrian<br><i>Súsdni</i> . <i>Irsd</i> is evidently a corruption of the Greek Iris."<br>"Iris root is considered by Muhammadan hakims to be deopstruen<br>aperient, diuretic, especially useful in removing bilious obstructions,<br>is also used externally as an application to small sores and <p<sup>mE V<br/>From the large number of diseases in which this drug is recommended<br/>it would appear to be regarded as useful in most diseases."</p<sup> |
| 430                                                                      | Iris kumaonensis, Wall.; Jour. Linn. Soc <sub>9</sub> XVI., 144.<br>Syn.—I. LONGIFOLIA, Royle, III., 372, t. 91.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MEDICINE.<br>Root.<br>431<br>Leaves.<br>432<br>FODDER.<br>Leaves.<br>433 | Vern.—Pi&g, karkar, tezma, PB.<br>Habitat.—An exceedingly plentiful plant on the grassy slopes of the<br>temperate and alpine North-West Himalaya, especially in Lahoul an<br>Ladak, and in the Chenab and Ravi basins generally.<br>Medicine.—Dr. Stewart states that in Chumba the ROOT and in<br>LEAVES are given in fever. In parts of Ladak the leaves appear to<br>given as fodder.<br>It seems probable that this or the next species is the source of the $\pounds \pounds$<br><i>pashdnbed</i> or <i>pokhdnbed</i> , which Dymock says is obtained from <i>y</i> »<br>Speaking of the drug Dymock says:—'' When soaked in glycerine<br>the odour musky and aromatic. The minute structure of the ${}^{rn h} \times {}^{rom} 1$ .<br>a general resemblance to that of Orris root, but numerous stellate rap!ec<br>are present. The drug is chiefly used as a diuretic. It is also believes<br>to.be an antidote for opium (dose, grs. 15).<br>Fodder.—In Ladak the leaves are said to be used as fodder.                                                                                                                                                                                                     |
| 434                                                                      | I. nepalensis, D. Don., non Wall.; Jour. Linn. Soc, XVI., '43'<br>Syn.—I. DECORA, Wall.; I. SULCATA, Wall. , van<br>Vern.—Chalntndar, sosan, shoti, chiluchi, PB. and NW. P. HIMALAYAW<br>NAMES. Madden, in his account the Himalayan CONIFER^,says,<br>this species is known in Kumaon as Nil Kamdl (blue Lotus) and i*ni<br>toxicarium as Chunder Kamal (white Lotus): both he says arc<br>near temples. I« nepalensis is the Nil Kanwal in Atkinson's<br>Mayan Districts.<br>Habitat.—A very plentiful plant in Nepal, extending west .to inform<br>Sutlej and the Beas, and met with in cultivation in Kashmir, being me<br>broad-leaved form often seen in grave-yards in the Panjab.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 435                                                                      | I. (Morea) Sisyrinchium, Linn.; Journ. Linn. Soc, XVI.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FOOD.<br><b>430</b>                                                      | <ul> <li>[Boiss., Fl. Or., V., i*o.</li> <li>Habitat.—Baluchistan (Quetta), Afghanistan.</li> <li>Food.—Mr. d. F. Duthie reports that the bulbs of this species are eaten in times of scarcity.</li> <li>1. 436</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (J. Murray*)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | IRON. |
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| Iris DSeudacorus, Linn.; Journ.Linn. Soc, XVI<br>Habitat.—Europe, Africa, Persia, &c.<br>Stewart mentions this plant as seen in and near K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | [FlOV <sup>r</sup> ·, "127.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 437   |
| ful of its having been correctly determined. The plant<br>to the natives as <i>Krishtin imarjal, marjal</i> , and was<br>5,000 feet above the sea. That species is not known,<br>genous to Kashmir, so that Stewart's plant was much<br>been I. cnsata.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | he refers to is known<br>found at altitudes of<br>however, to be indi-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |
| IRON, Ball, Man. Geology of India, III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ., 335-420.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 438   |
| Iron exists in nature in three great classes of ores-<br>Iron P rites, with the chemical composition of $FeS_2$ ;<br>(3), as OXIDE. The FIRST class is not directly work<br>obtaining the metal; the second and third are consect<br>mercia importance as sources of iron. The SEC<br>which iron exists as the carbonate, Fe CO <sub>3</sub> , cons-<br>kinds, namely, those in which the salt is crystalline at<br>earthy matter, and those in which a larger or sma-<br>intimately intermixed with the ferrous carbonate.<br>termed spathic iron ore {siderite spat hose 9 sparry or<br>bears the name of argillaceous ore or clay-ironstone.<br>in large deposits in many coal measures, and in this<br>black-band. The THIRD class of ores in which iro<br>may be divided into three sub-classes, namely, (1) the<br>essentially occurs as anhydrous ferric oxide (1)<br>which it occurs as hydrated ferric oxide (Fe <sub>2</sub> ,O <sub>3</sub> . I)<br>which the iron is in the form of ferrous and ferric oxis<br>sub-class magnetic oxide of iron, Fe <sub>3</sub> O <sub>4</sub> is the type.<br>The ores of the first sub-class are chiefly known<br>specular ores. Red hcematite is generally soft and fri<br>as red ochre or puddler's ore, but it also occurs in h<br>called kidney ore. Specular ore is a hard well-crystall<br>or black colour, and brilliant lustre. | -(1), as SULPHIDE, or<br>(2), as CARBONATE;<br>(2), as CARBONATE;<br>(2), as CARBONATE;<br>(3), as CARBONATE;<br>(4), as CARBONATE;<br>(5), as CARBONATE;<br>(5), as CARBONATE;<br>(5), and (5), and<br>(5), and (6), and (7), and<br>(7), and (7), and (7), and<br>(7), and (7), and (7), and<br>(7), and (7), that in<br>(7), and (7), and (7), and<br>(7), and (7), and<br>(7), and (7), and<br>(7), and (7), and<br>(7), and<br>(7 |       |
| The ores of the second sub-class most frequently<br>large amount of earthy matter, together with cons<br>sulphur and phosphorus. They are known as <i>brow</i><br><i>ore</i> , or <i>limonite</i> . In texture these ores differ conside<br>tite, being cindry or earthy in character, and rare<br>definitely crystallized hydrate, called <i>göthite</i> , is, however                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | siderable quantities of<br><i>vn hcematite, bog-iron</i><br>rably from red haema-<br>ely massive. A pure,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |

The ores of the third sub-class are known as *magnetic iron ore*, or *magnetite*. The purest varieties are strongly magnetic, and often exhibit polarity, when they are known as *loadstone*. The magnetic iron ores may be easily distinguished from the other oxides by the fact that they give a black streak when drawn over a white surface.

Iron exists in great abundance in many parts of India, occurring in one or more of the forms briefly detailed above, and has long been known and worked by the Natives. The prevailing ore is the magnetic oxide, but members of the other classes are also met with abundantly. For the following remarks regarding the mode of occurrence and distribution of iron in this country, the writer is indebted to the admirable and exhaustive account of the metal published by Ball.in his *Economic Geology\_irom* which the facts here given have been mainly compiled.

GENERAL REMARKS.—In the peninsular area magnetite occurs in beds or veins, in most of the regions where metamorphic rocks prevail. In some places, as in the Salem District of the Madras Presidency, it

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ENERAL EMARKS. 439

| IRON.               | Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| GENERAL<br>REMARKS. | is found in immense quantities, whole hills and ranges being formed of the purest oxide. Similarly, in the Chanda District, Central Provinces, enormous deposits of specular ore are found with which magnetite <sup>15*13</sup> ? present. The abundance and wide distribution of these ores in the ok*est rocks no doubt explains the frequent recurrence of deposits, and the general dissemination of ferruginous matter which more or less characterise the sedimentary rocks of all subsequent periods. In the submetamorphic or transition rocks, magnetite' <sup>1</sup> is known to occur in some localities. Also, along faults and fractures both $n$ the metamorphic and submetamorphic rocks, very considerable veins o* non-nite are to be found in many parts of the country, such as Cuddapah, *varnul, Manbhum, Jubbulpur, &c. The rich ores of Central India principally consist of haematites and occur in the Bijawar or lower transitios series trocks.                                                                                                                                                                                                    |
|                     | In the Vindhyan formation ferruginous matter is commonly dis-<br>seminated through immense thicknesses of beds, tinting the rocks it per-<br>vades; but in all localities in which the ores are sufficiently concentratea<br>to be workable, the deposits are found in veins, not in beds.<br>In certain of the conglomerates, sandstones, and shales of the Gond-<br>wana system, concretionary masses of limonite are abundant, wl?ile m<br>some of the coal-fields siderite, and clay ironstone, altered more or less<br>into limonite, occur imbedded in sufficient quantity to be of considerable<br>importance. It is believed that this limonite is used by Native smelters<br>in all the coal-fields, but the unaltered carbonates are rately if ever utilisea<br>in India, the Native furnaces being apparently unsuited for their <b>reduct</b> in<br>The next group, of so-called ironstone shale, is only represented in an<br>Damuda valley, and is largely utilised as a source of iron ore in the same<br>ganj coal-field, where there is an inexhaustible supply of readily a ??<br>ore. This ore, which originally existed in the form of black-band. <b>o</b> |
| }                   | In the next succeeding group, the Ranigani-Kamthi ferruginous matter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                     | absent, in others sufficient to tinge the whole rock, Segregated $\nabla^{nss}_{r}$ ,<br>and thin layers of ore also are found here and there, and are occasionally<br>utilised. Ore occurs in a similar way in the following groups or the<br>Gondwana series.<br>The cretaceous rocks of Southern India, in the Trichinopoly $Dk^{1}M^*$<br>contain nodules of iron ore in some abundance, which were formerly smeitea                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                     | to a considerable extent by the inhabitants. The Deccan trap includes a<br>large amount of iron ore, disseminated for the most part in minute crystals<br>of magnetite, but occasionally met with in nests of haematite, more rareiy<br>in layers which pass into ferruginous earth or bole. The beds of rivers<br>which traverse this trap not unfrequently contain magnetic iron-sand, w men<br>might be collected in sufficient quantity for the requirements of Native<br>furnaces, but rarely is so, owing to the brown haematite described below<br>being generally more readily obtainable in the same localities.<br>Segregated bands frequently occur towards the bases of beds of latente,                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                     | which are often prolific sources of an easily worked brown haematite, and<br>sometimes contain a high percentage of metal. These lateritic ores nave<br>been worked by native smelters in various localities, and at Bepur in Mala-<br>bar, and Muhammad Bazar in Birbhum, they have been utilised by British<br>Companies.<br>Lastly, detrital ores of sub-recent age occur in many localities, derived<br>trom the breaking up of the above deposits and from superficial accu-<br>mulations of ferruginous matter. These being in general easily obtained<br><b>I.</b> 439                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Iron. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                         | IRON. |
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| and more or less soft and decomposed, are frequently preferred by Natives<br>to the harder and more refractory ores <i>in situ</i> , which are more difficult<br>both to mine and reduce.<br>In the extra-peninsular area the principal sources of iron ores are the<br>tertiary formations; but in the North-West Himålaya, and also frequently<br>in Afghanistan and Burma, there are considerable deposits in the older |       |
| metamorphic rocks.<br><b>ron,</b> <i>Mallst, Geology of India, IV. (Mineralogy), 28, 49, 50, 52, 59.</i>                                                                                                                                                                                                                                                                                                                   | 440   |

## **Iron,** Mallst, Geology of India, IV. (Mineralogy), 28, 49, 50, 52, 59. FER, Fr.; EISEN, Ger.; FERRO, I/al. / HIERRO, Sp.

Vern.—Lohd, lohah, lohd chur=\ron filings, kkeri=\*stee\, giri=h\oom or ball of iron, nar=iron furnace, khit=s|a.g from iron furnace, karguha=|roxi furnace tongs, sansri=|von turnace, knu=s|a.g from from furnace, kargund=|roxi furnace tongs, sansri=|von tongs, HIND.; Lohd, I ah a, BENG.; Lokhanda, MAR.; Le'vu, Guz.; Irumbu, TAM.; Inumu, TEL.; Kabina, KAN,; Irumba, MALAY.; Dan, than, BURM.; Yakada, SING.; Ay am, Wham, lauha, SANS.; Hadid, ARAB.; Ahan, PERS.

Irumba, MALAY.; Dán, thań, BURM.; Yakada, SING.; Ay am, Wham, lauha, SANS.; Hadid, ARAB.; Ahan, PERS.
References.—Baden Powell, Pb. Prod., t-10, 53, 66; Atkinson, Him. Dish, 262-290; Economic Geology, Hill Districts, N.-W. P., Allahabad, 1877; Mason, Burma and its People, £65, 729; Old ham, Yule's Misson to Court ofAva (1855), 346; Balfour, Cyclop., II., 371; Rep. on Iron Ores, &c, of Madras Presidency; Hunter, Statistical Acct. of Assam (1879), I., 21, 231, 260, 209, 380; II., 210, 23s; Hooker, Himalayan Journals, II., 310; Ain-4-Akbari, Blochmann's Trans., 40,113; Gladwintrs Trans., II., 42, 126, 139, 170; Pharm. Ind., 364; Ainslie, Mat.Ind., /., 522-527; Moodeen Sheriff, Supp. Pharm. Ind., 141; U; C.Dutt, Mat. Med. Hind., 46; Fleming, Med. VI, & Drugs as in As. Res., XI. / Royle, Prod. Res., 3; Hope, Note on the Iron Industry in India; Govt. of India, Dept. of Revenue and Commerce, No. 6, Sept. i&73> Dept. of Finance and Commerce, No. 2899, August 4th, 1882; Molesworth, Note on Iron Manufacture by Private Enterprise, August i\$th, 1882; R. C. Von Schware, Rep. on Bengal Iron Works, Oct. 188r; Trade and Nav. Reps. Madras; Trade & Navigation Statistics of British India; " Pioneer," Jan. 25th, 1883; Gazetteers:—Mysore & Coorg, I, 429; Orissa, II., 68, 75, App. III., Bombay, IV., 130; V., 19, 124; VI., n; VIII, 50, 91; X., 30; XI., 134; XV., 19; Panjab:—Amritsar, 44; Gurgaon, i3; Gurdaspur, 60; Hoshiarpur, 113; Shahpur, 113; Peshawar, 24; N.-W. P., I., 58; Madras Manual of Administration, II., 36, 37, 38, ti\$; Bengal Adm. Rep. (i860), 125; Forbes, Settlement Rep. Calcutta (1872); Central Prov. Adm. Rep. (1864-65)» 5; (1865-66), 67; (1866-67), 78; District Manuals -.—Madras;- Cud' dapah 45; Trichinopoly, 68; Coimbatore, 22, 23; Settlement Reports.—Central Provinces, —Chanda, 4, 105, 113, 114; Damoh, 88; Upper Godavery, 4; Jubulpore, 87; Nagpur (SuppU), 276; Raipur, 7; Saugor, 3; Panjàb;—Dera Ghazi Khan, 7; Dera Ismail Khan, 7; Hazara, 9; Hoshungabad, 16; N.'W. P. & Oudh ;—Sabtpore, 12; also many ages in the publications of the Geological Survey and in the Journals of the Asiatic Society of Bengal.

OCCURRENCE, &C.—Mr. F. R. Mallet, Superintendent of the Geological Survey of India, has kindly furnished the following account of the regions in which Iron is found and of the manufacture of the metal in India:

Iron has not been found native except in meteorites, and, very rarely in volcanic rocks. It forms, however, an essential constituent of over a hundred minerals, although only a few of these are utilised for the extrac-tion of the metal. The most important ores are as follows, the percentage of iron they contain when pure being indicated by the figures :-

Magnetite, or magnetic iron, protosesquioxide; 72\*4. The black sand which is smelted in many parts of India consists of magnetite, with, very frequently, a varying proportion of titaniferous iron. *Hcematite*, or *red harmatite*, sesquioxide; 700. *Limonite*, or *brown hcematite*, hydrous sesquioxide; 59\*9. Ordinary laterite is an impure earthy variety of this ore. Siderite, or spathic iron, carbonate, 48'3 : clay-ironstone, or argillaceous *iron ore,* is an impure variety of the carbonate. *Black-band* is a carbon-

Magnetite. 442 Haematite. 443 Limonite. 444-Siderite. **445** Black-band. 446

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Nation Mathed of

| IRON.                          |  |
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| OCCURRENCE<br>Ilmenite.<br>447 |  |

thods d Iron. 448

| <br>Native Method of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| aceous clay-ironstone. <i>Ilmenite</i> , or <i>titaniferous iron</i> , an ore allied to haematite, but having a portion of the iron replaced by titanium, may also be mentioned, although it is of comparatively little importance.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MANUFACTURE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NATIVE METHODS—IRON.—In former times the manufacture of iron by<br>native methods was widely practised throughout the various provinces or<br>India, but within the last few decades, and more especially during the last<br>quarter of a century, since the opening of railway communications, the<br>competition of English iron has done much to curtail, and in many cases<br>has entirely extinguished, the native outturn. A long list of places might,<br>however, be given, in which the manufacture survives.<br>According to the method most usually adopted, the furnace,, which is<br>built of clay, is some three or four feet in height, more or less, although |
| the dimensions vary very considerably in different parts of the country.<br>Both the exterior and interior are more or less conical in form, the $ci[cU'']$ lar cross section at the bottom being greater than that at the top. Neak'                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| the better in funct is on original which is storned with alow while the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

try. ak' the bottom in front is an orifice which is stopped with clay while the furnace is in blast, and through which the bloom is removed at the end ot the operation. Clay tuyeres are inserted near the base which convey the blast from two skin bellows, worked alternately, so as to keep up a continuous stream of air. The fuel used is charcoal, and no flux is added with the ore. After the furnace has been brought to a sufficiently here. temperature, the ore, sometimes in the form of natural sand, but more commonly after having been pounded to small fragments or coarse powder, is sprinkled in at the top, in small quantities at frequent .mtervals, \_and alternately with a sufficiency of charcoal to keep the charge nearly level with the top off the furnance. Furn timeneo to memoduring inthe the form (which lasts several hours) the slag is removed through a hole which whi then stopped with clay. When such a quantity of ore has been added as will produce a bloom of iron of the size proper to the furnace used, the blast is stopped, the orifice opened, and the bloom removed. It is a pasty mass of *malleable* iron containing a good deal of intermixed slag, which is removed as far as practicable by immediate hammering. But before use the iron needs further refining by re-heating and hammering, a  $P^{roce}-f^{\bar{*}}$ which is sometimes carried out more than once, and which serves at the same time to bring the iron into more usable shapes.

In some cases the refining is done by the smelters, but very commonly they cut the bloom almost in two halves, to show the quality of the mass to the purchaser, and sell it in that state, the refining being Sone by others. The expenditure of charcoal is very great in proportion to the result oDtained (according to Mr. Ball, as much, sometimes, as 14 tons of fuel to i ton of finished iron), and a large quantity of metal remains in the sigg, so that the process is an extremely wasteful one (thus it is stated by iwr, Heath that in the Salem district magnetite, containing 72  $P^{er cent <}$  of metal, yields only 15 per cent, of its weight of bar iron). At the same time the iron obtained is generally of very good quality, and were it nor -on account of the convenient forms in which English iron can be obtained, the Indian product would have less difficulty in maintaining its position amongst the native smiths. On account of this competition, and also from increasing scarcity of fuel, "one finds" (as remarked by Mr. Ball) "the iron smelters in many regions the hardest worked, but poorest, amongst the population. The iron is sold at a high price, but the bulk of the  $\pounds \pounds i t ?^{\circ e}?^{to the}$  traders through whose hands the metal passes. The Sm\*11d "?" Prodl\*ced bears but a miserable proportion to the labour, time, and material expended."

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| Iron Manufacture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | {F. R. Mallet)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IRON.                                              |
| Although the method most commonly adopted apless closely, to that described above, wide variations in some regions. Thus, in Manipurthe tuyeres are in the furnace, while in front, and opposite to them, is a raperture some nine inches across. The products of through this, the chimney above being merely used for and fuel, so that the furnace is practically an open here. <i>Mem. G. S. /., XIX.</i> , 240), 'At Puppadoung, in Upper are worked with a natural draught only, no bellows <i>Blanford, Journ. A.S.B., XXXI., 21 g</i> ). In Kathiawaring to a not very clear description, is rectangular in stal instead of vertical ( <i>Jacob, Selec. Rec. Govt. Bomb.</i> Birbhum, as observed by Dr. Oldham, in 1852, the fusual capacity, and produced <i>pig</i> iron, which was recondition by subsequent refining ( <i>Selec. Rec. Govt. I</i> trary, again, to the practice in India, the smelters of limestone as a flux (4. <i>Ver chive, Jour. A. S. B.</i> , <i>XXX</i> . The bellows also vary greatly in their form and stifurnaces, a pair, each made from a single goatskin, used, while those employed for the larger are sometim hides. Some forms are worked by hand, while in oth sons stand with one foot on each bellows, and transfer nately from one to the other.                                                                                                                                                                                                                                                                        | from it are in vogue<br>serted at the back of<br>coughly semi-circular<br>combustion pass out<br>or feeding in the ore<br>arth $\{R. D. Old ham,$<br>Burma, the furnaces<br>s being used (W. T.<br>the furnace, accord-<br>section, and horizon-<br>., XXXVII., 467). In<br>furnaces were of un-<br>duced to a malleable<br>Bengal, VIII.). Con-<br>the Waziri hills add<br>XVI., pt II., 21).<br>ize. For the smaller<br>are most frequently<br>nes made of bullock*-<br>hers one or two per-                                                                 | MANUFAC-<br>TURE.<br>Native<br>Methods of<br>Iron. |
| STEEL.—The process by which the Indian steel, kn<br>duced, has been described by several writers. The Sale<br>used to be one of the most important centres of produc<br>has written a very clear account of the method employ<br><i>Soc, V.9 390</i> ). The iron, which is smelted from magnet<br>is refined by repeated heatings and hammerings, an<br>into bars measuring about 12 inches X 1   x J. Thes<br>pieces, a number of which, aggregating from half a pour<br>weight, are packed closely in a crucible, together w<br>weight of dried wood chopped small; the whole is co<br>or two green leaves, and the mouth of the crucible fille<br>clay, rammed in close. As soon as the clay is dry, from<br>are built up, in the form of an arch, in a small furm<br>and the blast kept up for alx>ut 2  hours; the crucible<br>allowed to cool, broken, a/id the cakes of steel, which<br>the bottom of the crucible, taken out. When the f<br>fect, the top of the case is covered with striae radiati<br>The cakes are subsequently heated for several hours a<br>below their melting point, and turned over in the cur<br>bellows. The object of this treatment, in Mr. Heath's o<br>tion, by oxidation, of the excess of carbon which the<br>to which they owe their comparatively low fusing<br>operation is completed, the cakes are hammered out in<br>in which state the steel is sold.<br>The crucibles are formed of a refractory "red lo<br>large proportion of charred rice-husk. The wood used<br>auriculata, and the leaves those of the Asclepias giga | em district in Madras<br>etion, and Mr. Heath<br>yed <i>{Journ. Roy. As.</i><br>lite in the usual way,<br>d eventually formed<br>se are cut into small<br>ind to two pounds in<br><i>i</i> th a tenth part by<br>overed over with one<br>ed up with tempered<br>m 20 to 24 crucibles<br>ace, which is lighted,<br>es are then removed,<br>ch have the form of<br>fusion has been per-<br>ing from the centre.<br>at a temperature just<br>rent of air from the<br>pinion, is the ejimina-<br>e cakes contain, and<br>point. When this<br>nto short stout bars, | Steel.<br>449                                      |

not procurable, those of the Convolvulus laurifolia [Lettsomia elliptica, Wight],

It appears that in some cases the blooms produced in the ordinary iron furnace, after refining in the usual way, are sufficiently steely for em-ployment in the fabrication of edged tools, which are tempered by plunging them while hot into water. A steely iron thus made in the Jabalpur district 503

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| 1011 101 17 P. N. Bose, 1012., XXI., 83). But in the district of Darjeening C. S. iron is smelted from magnetic containing no manganese (Mem. G. S. XL, 67).<br>ENGLISH METHODS.—Numerous attempts have been made to a ve bee ture iron on the English system in India, but nearly all of $t_{*}$ iese v insuccessful and have been long since abandoned ; one of the . <sup>CTM** c</sup> ause of failure being the difficulty in keeping large furnaces supplied with char in the Salem district; and at Beypur, in Malabar. Pig-iron was smelg from the Salem ore, part of which was sent to England, and comma pogood price for conversion into steel; a large quantity of it was used · w construction of the Britannia and Menai bridges. Excellent s eei also produced at the Indian works, and iron was smelted at Beypur 'col company, however, appears never to have paid a dividend, and the cern was a steadily losing one. About 1855, the Birbhum Iron ^ r Company commenced operations, and produced pig-iron of good In the State of Indore; but, when the preparations for smelting '' and the preceding ventures. About 1861 works were commenced at is wai, in the State of Indore; but, when the preparations for smelting '' abouts, works were established at Naliun, in the Punjab State of Sirm, The enterprise, however, has not hitherto proved a financial success, or chiefly, to the long distance and bad roads over which the ore has conveyed from the mines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 1012 101 J. P. N. Bose, 1012., XXI., 83). But in the district of Darjeening C. S. iron is smelted from magnetic containing no manganese (Mem. G. S. XL, 67).<br>ENGLISH METHODS.—Numerous attempts have been made to a ve bee ture iron on the English system in India, but nearly all of $t_{*}$ iese v insuccessful and have been long since abandoned ; one of the . <sup>CTMWE c</sup> ause of failure being the difficulty in keeping large furnaces supplied with char in the Salem district; and at Beypur, in Malabar. Pig-iron was smelg from the Salem ore, part of which was sent to England, and comma pogood price for conversion into steel; a large quantity of it was used · w construction of the Britannia and Menai bridges. Excellent s eei also produced at the Indian works, and iron was smelted at Beypur 'col company, however, appears never to have paid a dividend, and the cern was a steadily losing one. About 1855, the Birbhum Iron ^ real But from various causes the works were financially a failure. I ne 1 maun Iron-works were started in 1857, and after many vicissitudes f/J like the preceding ventures. About 1861 works were commenced at is wai, in the State of Indore; but, when the preparations for smelting wai, in the State of Indore; but, when the project. In $1 \wedge c^{1/2}$ (Cennary complete, it was decided to abandon the project. In $1 \wedge c^{1/2}$ (Cennary converse), however, has not hitherto proved a financial success, or chiefly, to the long distance and bad roads over which the ore has conveyed from the mines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | IRON.             | Manufacture of Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2. English Method of-<br>450 ENGLISH METHODS.—Numerous attempts have been made to ture iron on the English system in India, but nearly all of $t_{s}^{tese}$ is a vector of failure being the difficulty in keeping large furnaces supplied with charged of failure being the difficulty in keeping large furnaces supplied with charged of failure being district; and at Beypur, in Malabar. Pig-iron was smear from the Salem ore, part of which was sent to England, and command good price for conversion into steel; a large quantity of it was used to construction of the Britannia and Menai bridges. Excellent s eei also produced at the Indian works, and iron was smelted at Beypur 'collection' company, however, appears never to have paid a dividend, and the retrieve was a steadily losing one. About 1855, the Birbhum Iron 'recompany commenced operations, and produced pig-iron of goodLauge But from various causes the works were financially a failure. I ne is maun Iron-works were started in 1857, and after many vicissitudes f/l like the preceding ventures. About 1861 works were commenced at is wai, in the State of Indore; but, when the preparations for smelting is nearly complete, it was decided to abandon the project. In 1^AO'/Q'n, abouts, works were established at Naliun, in the Punjab State of Simmathing the enterprise, however, has not hitherto proved a financial success, ow chiefly, to the long distance and bad roads over which the ore has conveyed from the mines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | MANUFAC-<br>TURE. | is produced from a highly manganiferous hæmatite (Rec. G. S I., XVI.,<br>101; P. N. Bose, Ibid., XXI., 88). But in the district of Darjeeling similar<br>iron is smelted from magnetite containing no manganese (Mem. G. S. I.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| posed for use. In 1875, however, an experimental trial was method determine whether the rich iron ores of Chanda could be smet! Let a commercial scale with the coal raised in the same district. Investigation of the same time (1874) the coal raised in the same district of the fuel, and its unsuitability to the purpose in it. About the same time (1874) the Bengal Iron Company commenced on tions at Barakz.r, in the Raniganj coal-field. The ore employed, the same standard from the surface in the neighbourhood of the works, of abundantly in the ironstone shale group of the Damuda (coal-Dear series. In these rocks the ore forms bands and nodules of clay, it on the surface this has been altered into an earthy peroxide, pa hydrated and partly hematitic. It was this altered form which was structure and in the Karharbari collieries. For flux, limestone obtained at, i-an hill, and at Hansapathar, a few miles further off, was employed, agether the company produced 12,700 tons of pig-iron, but it was concern was taken over by Government, and placed under the man ment of Ritter von Schwartz. One blast furnace, on an improving the end of 1888 being 30,616 tons. A second blast furnace, on an improving type, has lately been erected to meet the increasing demand for pig-iron up the end of 1889-90, and 20,000 in the year following. The annual of sumption of pig-iron in the foundry is at present about 2,000 tons, the cings being chiefly pipes, sleepers, bridge-piles, ornamental work, railing a stale-boxes, and agricultural implements. To Ritter von Schwartz below is sumption of pig-iron in the foundry is at present about 2,000 tons, the cings being chiefly pipes, sleepers, bridge-piles, ornamental work, railing a stale-boxes, and agricultural implements. To Ritter von Schwartz below is sumption of pig-iron in the foundry is at present about 2,000 tons, the cings being chiefly pipes, sleepers, bridge-piles, ornamental work, railing a stale-boxes, and agricultural implements. | Method of-        | <i>XL</i> , 67).<br>ENGLISH METHODS.—Numerous attempts have been made to manufac-<br>ture iron on the English system in India, but nearly all of $\frac{1}{2}$ (Eq. (a) we been<br>insuccessful and have been long since abandoned ; one of the $\frac{1}{2}$ (a) (a)<br>of failure being the difficulty in keeping large furnaces supplied with chardon<br>In 1833 a company was formed, with works at Porto Novo, in South A. 'ted'<br>in the Salem ore, part of which was sent to England, and commany end<br>good price for conversion into steel; a large quantity of it was used. 'wa'<br>construction of the Britannia and Menai bridges. Excellent <i>s</i> eei ''''<br>also produced at the Indian works, and iron was smelted at Beypur 'coxim<br>company, however, appears never to have paid a dividend, and the 'fte<br>cern was a steadily losing one. About 1855, the Birbhum Iron '''<br>Company commenced operations, and produced pig-iron of goodI ou to the<br>maun Iron-works were started in 1857, and after many vicissitudes f/L'<br>like the preceding ventures. About 1861 works were commenced at Derry<br>wai, in the State of Indore; but, when the preparations for smelting ''''<br>abouts, works were established at Naliun, in the Punjab State of Simm-<br>The enterprise, however, has not hitherto proved a financial success, or<br>chiefly, to the long distance and bad roads over which the ore has<br>conveyed from the mines.<br>In all the attempts noticed above, charcoal was the fuel used, or p'<br>About the same time (1874) the Bengal Iron Company commenced of Simm-<br>About the same time (1874) the Bengal Iron Company commenced of the ''<br>a commercial scale with the coal raised in the same district.<br>Prosed for use. In 1875, however, an experimental trial was mat'' a<br>a commercial scale with the coal raised in the same district.<br>Priment was not successful, the failure being attributed mainly to<br>the '' and<br>a commercial scale with the coal raised in the same district.<br>Priment was not successful, the Bengal Iron Company commenced of the ''<br>a so thained from the surface in the neighbourhood of the wor |

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| Iron Ores of India. (F. R. Mallet.)                                                                                  | IRON.                |
| smelted in India on European principles." The Baråkar Iron Works were again sold to a Company by Government in 1889. | INDIAN IRON<br>ORES. |
|                                                                                                                      | Madras.<br>451       |

| IRON.                | Iron Ores of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| RON ORES.<br>Madras. | Excellent iron is produced in the Salem district, but, as in so many other parts of India, the outturn is decreasing, partly from the g^^n gracticy of charcoal, and partly from the influx of English iron. The manufacture of steel has been described on p. 503. The ore smelted at the Porto Novo Iron-works was brought from balem.<br>South Arcot.—Ore is abundant, and has been smelted in a very <sup>3</sup> a <sup>[1]</sup> 'E number of villages, more especially in the taluks of Trinomalai and Kallakurchi. The manufacture of steel has also been carried on. <i>#</i><br>North Arcot.—About the year 1855 there were 86 villages where smeltaing was conducted. The ore principally used was "black sand," but solid ore (magnetite?) was raised in many places. It is said that ore was mined "in every taluk."<br>Chingalpat.— Magnetite is stated to exist in considerable quantity in the hills near the town of Chingalpat.<br>Nellow.—Numerous beds of magnetite occur in the schistose gneiss near the town of Ongole, and in the lower part of the Gundlakamma valley. Haematite schist has been noticed in the Chundi hills. Iron used to be smelted in the district, but the industry appears to be now extinct. Kadapah and Karnul.—Iron ore is pretty generally distributed in the rocks of the two formations named after these districts, but that which is seamed with great veins of very pure specular iron. Rich deposits also occur south-east of Ramulkota; but there are numerous other localities in both districts where mining is carried on, the ore being generally haematite.<br>Mantipur.—Iron is said to be abundant, the ore being, in part, at least, of the same character as that in Bellary.<br>Bellary.—In the Sandur and Copper hills to the west of the chief town of the district "the supply of splendid haematite ore is absolutely unlimited." It occurs in a series of bands interstratified with schiat and contemporaneous trap belonging to the Dharwar series. The old iron in dustry is, however, nearly extinct, owing mainly to the scarcity of fuel.<br>Similar ore also occurs in profusion in the "Penn |
| Mysore.<br>452       | MYSORE.<br>Ashtagram division.—Ores, which are in large part magnetite, are<br>abundant in many places, but the number of mines is not very great.<br>Bangalore division. —Both iron and steel are produced, the ore princi-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| Iron Ores of Iudia. (F. R Mallet.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | IRON.                 |
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| the manufacture of steel wire, which has been sent to remote parts of India<br>for the strings of musical instruments.<br><i>Nagar division.—Here</i> also iron and steel are manufactured, "black<br>sand" being the ore chiefly employed. In the Shimoga district iron ores<br>are worked in some parts. In Kadur, they are largely obtained and smelted<br>along the hills east of the Baba Bud an, and those round Obrani. Ore,<br>probably haematite, is largely developed in the hills near Chitaldrug.<br>In Mysore, as in so many other parts of India, the outturn of iron has<br>greatly diminished during the last few decades.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IRON ORES.<br>Mysore. |
| HAIDERABAD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Haiderabad.           |
| Haematite occurs in profusion in the "Pennar-Haggari band" of Dhárwar rocks, which traverses the <i>Lingsugur district</i> , as noticed under Bellary. Fairly rich beds of magnetic iron have been found nine miles to the south-east of the town of Khamamet, and a very large and important band of the same ore occurs close to the Singareni coal-Reid, in the same district ( <i>Khamamet</i> ). haematite is obtainable about four miles north of the field. The co-existence of such rich ores, coal, and limestone in the same neighbourhood naturally suggests Singareni as one of the localities in India most favourably circumstanced for the manufacture of iron on European principles. Smelting has been carried on extensively, in native furnaces, in the parganas of Kallur and Anantagiri. Haematite, titaniferous ironsand, and yellow and red ochre are stated to occur in <i>Warungul</i> . Steel-making has been carried on at several villages in <i>Yelgandal</i> , but one of the most celebrated places for its manufacture is Konasamundram in <i>Indor</i> , 12 miles south of the Godávari and 25 from the town of Nirmal. Accounts written some fifty years ago state that most of the outturn was bought by dealers from Persia who travelled to Konasamundram for the purpose, and that the steel was used in making the celebrated Damascus sword blades. Two kinds of iron were used in its production—one from Mitpalli smelted from "ironsand," or from Dimdurti, reduced from magnetic occurring disseminate through gneiss and mica schist, and the other from Kondapur smelted from an ore "found amongst the iron clay" (laterite?): three parts of the former were employed to two of the latter. A boundless supply of the above ores is said to be obtainable. | 453                   |
| CENTRAL PROVINCES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Central               |
| Bastar.—Iron ore is said to occur, in immense quantities, on the Bela<br>Dila, and in the valley of the Jorivág river; also less plentifully towards<br>the North-Western boundary. The quality is good, but it is little worked,<br>as the demand is insignificant.<br>Sambalpur.—'* Iron ore is found in nearly all the zamindáris and Garh-<br>jdt States. It is most plentiful and of the best description in Rairakhol.''<br>The metal has been smelted in some quantity at Kudderbuga, 20 miles<br>north-east of Sambalpur, from altered magnetite. Ores obtained from<br>the Barákar group, and, less frequently, from the Upper (Hingir) sand-<br>stone are used in other places.<br>Bildspur.—Ores are to be found in many places, although they are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 454                   |

| IRON.                                       | Iron Ores of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| IRON.<br>RON ORES.<br>Central<br>Provinces. | <ul> <li>Chanda.—This is one of the most remarkable districts in India, containing "enormous and splendid accumulations of ore" which occur principally in the metamorphic rocks. Haemattie is the most abundant, and furnishes all the supplies for the native furnaces; but magnetite and limonite also occur. The most noted localities are: Lohara, where haematite of extreme purity forms an entire hill fths of a mile long, 200 yards broad, and 120 feet high; Pipalgaon, near which there is an enormous amount of similar ore; Dewalgaon, in the vicinity of which there is a hill 250 feet high, composed in large part of haematite; Ratnapur, where a very rich lode of brown iron ore, 40 and 50 feet thick in places, has been found; and Dissi, the lode near which is of haematite and magnetite. Immense deposits also exist at Gunjwdhi, Ogalpet, Metapur, Bhdnapur, and Mendki. The unsuccessful attempt to smelt the Chanda ores with the coal of the same district has been already noticed.</li> <li>BdInghd.—The iron industry is very near extinction, although a few furnaces still struggle for existence in the Baila, Kini, and Bhánpur zamindáxis. Ore from the lateritic rocks is that chiefly used. ", Bhanddra.—The ore commonly smelted in this district is lateritic, and the metal produced from the mines at Agri and Ambighari in <sup>116</sup>. P?r' gana of Chandpur is said to be of excellent quality. About the middle of the century 160 furnaces were at work.</li> <li>Magnur.—Ore of good quality is reported to exist near Mansar. <i>Mandla</i>.—Lateritic ore is known to exist.</li> <li>Mindr.—Some ores of poor quality have been noticed to the southeast of Barwai and near Pundsa.</li> <li>Marsinghpur.—Tendukhera has long attracted notice owing to tne excellent quality of the iron manufactured there, which is said to command a higher price than any other iron made in the Narbada <sup>2728</sup>% in 1830 a suspension bridge over the Bias river, in Sagar, was opened, the iron for which had all been smelted in native furnaces at Tendukhera. The ore</li></ul> |
|                                             | the transition rocks and in the laterite. The ore in the older series is<br>mainly haematite, in part manganiferous, while that in the lateritic form-<br>ation is limonite. The transition ores are worked in several places, and<br>iron is still smelted on a somewhat considerable scale in the district. Gan-<br>gai is perhaps the only spot where magnetite is raised. At Agaria and<br>Partabpur there are whole hills of schistose and micaceous haematite, con-<br>taining only traces of phosphorus and sulphur. The micaceous variety is<br>mined in preference to the other from being softer. The Janli mine, how-<br>ever, is the most extensively worked in the district, the ore, being an<br>ochreous haematite, is easily extracted, and probably has been found by ex-<br>perience to be easy of reduction. <sup>TM</sup> Olpherts <sup>1</sup> metallic paint" is made from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| <u></u> | Iron Ores of India.                             | (F. 1    | R. Mallet) | IRON.      |
|---------|-------------------------------------------------|----------|------------|------------|
|         | At Mangeli, Mogala, Gogra, and Danwai in the Lo | ra ridge | a manga-   | IRON ORES. |

At Mangeli, Mogála, Gogra, and Danwai in the Lora ridge, a manganiferous haematite is worked, the iron produced therefrom being a hard steely kind used for edged tools. The iron smelted from the Agaria, Partabpur, and Janli ore is much softer. Manganiferous haematite also occurs in large quantity at Gosalpur, where limonite is also found.

The laterite ores occur in beds near the base of the formation, and consist of rich pisolitic limonite. They are obtainable over a wide area to the east, ncrth, and south-west of Marw&ra, the KanhwaYa hills being especially rich in such. The laterite ore used to be smelted on a considerable scale, but of late years the mines have been abandoned.

The opening out of the Umaria Colliery has recently directed attention to the advantages north-eastern Jubalpur possesses for the manufacture of iron on European principles. M agnificent ores, pure limestone, and coal are all comprised within a comparatively small area.

## CENTRAL INDIA.

*Rewah.*—The broad band of transition rocks which traverses this State parallel to, and south of, the river Son, is known to contain iron ore, which is also believed to exist in the coal-measure strata.

*Bandelkand.*—The transition rocks, which occupy a large area in the State of Bijawar, in some places contain abundance of rich haematite. It is worked on a considerable scale, Herapur being one of the chief centres of production.

*Gwalior*.—Iron ores occur most profusely in the transition rocks which extend over a wide tract to the southward of Gwalior Fort. The mines at San tan, Maesora, Gokalpur, Dharoli, and Banwari are described as extremely rich, the ore being schistose and more or less ochreous haematite, which is manganiferous at Santan. Haematite is also worked at Raypur, Par hill, and Mangor, while magnetite is obtained at Gokalpur and Girwai. All the above mines are within 10 miles of Gwalior, except those at PaY hill and Mangor which are at a somewhat greater distance. The ores are said to contain only traces of sulphur, and no phosphorus. Limonite occurs at Binaori, Baroda, Imilia, Gunjari, and Baron, villages between 45 and 80 miles from Gwalior. But the ore is inferior to the anhydrous kinds.

About 50 miles to the north-west of Gwalior there is a forest, which it is estimated would, without replanting, supply fuel for an outturn of 12 tons of bar iron a day for a period of 900 years.

The mines of Bágh (about 60 miles west-south-west of Indore) have long been celebrated. They are in the transition rocks, the ore being haematite.

*Indore, Dhdr,* and *Ch&ndgarh.*—The same rocks are exposed near Barwai, and cover large areas in the *Dhdr* forest and north of Chdndgarh. Rich deposits of haematite occur in connection with them, some of which are found along fault lines, while others are surface accumulations derived from the older rocks.

AH Rajpur.—Some ore has been observed in the metamorphic rocks.

BOMBAY.

North Kanara.—Ore (apparently lateritic) occurs in the Sahya'dri range. Dhdfwar. - Formerly, when fuel was plentiful, much iron was smelted in the Kappatgudd hills.

*Kaladgi.--The* haematite, occurring in the *Dhdr war* series, has already been noticed in connection with the Bellary district.

*Belgaum.—Iron* was formerly smelted in several places, but the manufacture is now extinct.

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Bombay. 456

Central India.

455

Central

Provinces.

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| IRON.                | Iron Ores of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| RON ORES.<br>Bombay. | Goa<— Iron ore is found at Bdga, Satdra, Pernem, and especially in th<br>District of Zambaulin.<br>Sawantwdri and Kholapur— Iron is (or used to be) produced from<br>(apparently lateritic) ore.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                      | Ratnagiri.—The metamorphic rocks are said to contain magnetite o<br>haematite near Mdlwdn. Lateritic ore is also found in the district, and<br>formerly was largely smelted.<br>Sdtdra.—Lateritic ore has been utilised here also, but, apparently, or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                      | only a small scale.<br>: Surat—Iron ore is said to be found in the Balsar and Pardi Subdivisions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| •                    | <i>Rewa Kdntha.—Iron</i> seems to have been once worked on anr<br>scale along the western limits of the district. Near Ja''mbughoda, "TM**<br>and Ladkesar large heaps of slag still remain. Near Mohan, in onno<br>Odaipur, a bed of haematite, of limited extent, occurs in the Nimar sand<br>stone.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                      | Panch MahalsAt Palanpur, in Godhra, ore of considerable richnes<br>is found.<br><i>Kaira and Ahmadabad.</i> —Heaps of slag, in certain places, show that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                      | iron was formerly produced.<br><i>Kdthifitvdr.</i> —Even fifty years ago the manufacture of iron was in provide the moribund condition, and to-day there is not a single furnace in blast, the west, the laterite yielded very rich ore, while the ironstone bands, near the top of the Omia (Jurassic) beds, were utilised in the northern part the peninsula.<br><i>Cutch.</i> —Here also the industry is extinct. Much of the ore former used was derived from the haematitic laterite of the sub-nummuhtic gro Y                                                                                                                                                                                                                                     |
| Rajputana.           | RAJPUTANA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 457                  | Sind.—Almost the only ore hitherto discovered, in sufficient $QJf_{a}^{8/r*11}$ ?<br>iron-making, is in the passage beds between the Kirthar and Kan<br>groups, north-west of Kotri, Masses of magnetite, and bands of. <sup>red</sup> an<br>brown haematite, more or less pure, occur, however, in considerable q.<br>tity, in many places. The scarcity of fuel in Sind renders the ranty<br>iron ore bi little importance. Large deposits of iron ore occur, in seve<br>places, in the Arvali (transition) rocks. Some of these are situated<br>Marwar, Ajmere, Bundi, Kota, and Bhartpur.<br>Meyivdr.~A promising bed of limonite exists near Gangar, wnicn<br>worked to some extent.<br>Jaipur.—Large quantities of ore have been raised at Karwar, |
|                      | Hindaun, but the workings are now abandoned $_{fl}r \sim AlwarThe$ mines at Bhdngarh still produce large quantities 01 of and are now the only source of supply for the numerous furnaces <sup>m</sup> Alwar territory. The ore is a mixture of limonite, magnetite, and <sup>ma T 1</sup> here source of and extensive mines near Rajgarh are no lon 5~ worked, but the deposit extends in a regular belt for a distance of over it miles, and has an average width (it is said) of 500 feet; the ore consisting chiefly of rich haematite and limonite.                                                                                                                                                                                                |
| Panjab.              | PANJAB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 458                  | Bannu.—The hills 25 or 30 miles south-east of Bannu are reported to<br>contain haematite in abundance. The iron produced from it is in great<br>demand at Kålabågh.<br>Peshdwar.—It is said that iron is smelted in Peshawar, and other neigh<br>bouring places, from ore (magnetic ironsand?) obtained from Bajaur.                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Iron Ores of India. (F. R. Mallet.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | IRON.                 |
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| <i>Kdngra.</i> —Magnetite, which occurs in the metamorphic strata, "is available in any quantity," and the iron produced from it is of great strength and tenacity. Magnetic ironsand, derived from the above, and beematite are also found                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | IRON ORES.<br>Panjab. |
| haematite, are also found.<br><i>Mandi.</i> —There are a few villages where smelting is carried on from<br>the same ore as in Kdngra.<br><i>Simla Hill States.</i> — <i>Some</i> iron is produced in Bashahr, Jabbal, Dhami,<br>and perbaps in other States, the ore commonly used being magnetic iron-<br>sand. There are mines of magnetic ore in Kot Khai, and at Chaita, in<br>Sirmur. The last named supply the ore for the Raja's smelting works at<br>Nahan.                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |
| <i>Gurgaon.</i> —Firozpur, in the extreme south, once possessed consider-<br>able smelting works, the ore used being haematite. It would appear that<br>some iron is still produced there.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |
| KASHMIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Kashmir.              |
| Limonite has been extensively mined on the Punch river, in the outer<br>hills. Iron is also worked in the neighbourhood of the Dragar mountain<br>to the north of Pansir, in the Riási district, at the village of Soap, or Sufa-<br>hán, situated on the Bimwár river, at the south-eastern end of the Kashmír<br>valley, at Arwan, near Sopur, and Shar, near Pámpur. In Ladákh, at the<br>village of Wánla, nearly due south of Khalsi on the Indus there are very<br>extensive iron works.                                                                                                                                                                                                                                                                                                                                                                                                                | 459                   |
| NORTH-WEST PROVINCES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NW. Pro-<br>vinces.   |
| Kumaun.— $ n $ several parts of Kumaun deposits of iron ore occur<br>some of which are rich and abundant. Amongst the localities which have<br>attracted most notice is Rámgarh, near which several mines (Pahli, Losh-<br>giáni, Natna Khán, Parwára, &c.) have been worked in micaceous haema-<br>tite and limonite. Haematite and micaceous iron also exist near Khairna,<br>but the deposits are not of much importance. Very large quantities of<br>ore, which is earthy haematite and limonite, occur in beds in the Siválik<br>strata, in the neighbourhood of Káladhungi and Dechauri. The Dechauri<br>ore is of better average quality than the other.                                                                                                                                                                                                                                               | 460                   |
| <i>Lalitpur.</i> — At Salda, in the Maraura pargana, a considerable amount of iron is smelted from haematite, while a hard steely kind is made at                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |
| Pura.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                     |
| <i>Bdnda.</i> —In pargana Kalyángarh iron is rather extensively worked at several points, especially at Gobarhái. There are also mines at Deori and Khiráni.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |
| <i>Mirzapur.</i> —The metamorphic rocks in the southern part of the dis-<br>trict contain some small bands of magnetite, which have been worked on<br>a trivial scale.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |
| BENGAL.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Bengal.               |
| Orissa.—Iron of excellent quality has been produced in Lálcher, the<br>ores used being chiefly derived from the sandstones of the coal-measure<br>and upper groups. Smelting is (or used to be) also carried on in Dhen-<br>kanal, and probably other tributary states as well as in Katták.<br><i>Burdw&amp;n.</i> —In the Ranigdnj coal-field throughout the ironstone shale<br>group, but more especially in the upper part of the group, bands and<br>nodules of clay ironstone are common, and constitute an inexhaustible<br>supply of ore. When unaltered, the ore is either clay-ironstone or black<br>band (a carbonaceous variety of the same), but near the surface it has been<br>converted into earthy haematite or limonite, or a mixture of both. It is<br>this altered form that is used at the Barákar Iron-works, which have been<br>briefly noticed in the preceding part of this article. |                       |

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| IRON.                 | Iron Ores of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| IRON ORES.<br>Bengal. | Birbhum.—Iron used to be made on rather a large scale, the kacha,<br>or crude, metal unlike that produced in other parts of India, resembling<br>pig-iron, from which pakka, or refined, iron was produced by a sort of<br>puddling process. The ore used in the Birbhum Iron-works Company's<br>furnaces was obtained from beds near the base of the laterite.<br>Bhdgalpur and Monghyr.—Some smelting has been carried on in<br>both districts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | <i>Gyd.</i> —A raiher large deposit of magnetite has been found HI the Bara-<br>kar hills, which has not been worked, although iron has been made from<br>other ores.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                       | Hazdribdgh.—-Furnaces are numerous in the vicinity of the BokArs ami<br>Karanpura coal-fields, where ore from the ironstone shale group is used.<br>Magnetite from the metamorphic rocks is also smelted in places<br>Mánbhum.—A portion of the Rániganj coal-field, noticed under Bard-<br>wán, is situated in Mánbhum. Magnetite exists in both the metamorphic<br>and transition rocks, but not in very great quantity. Ilmenite occurs also,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                       | and the excellent quality of some of the native-made iron has been attri-<br>buted to the presence of this mineral in the magnetic iron-sand used in<br>the furnaces. In places along the line of disturbed junction between the<br>rocks just mentioned, there are veins or lodes of red and brown haematite,<br>the latter sometimes in great abundance. Other deposits, again, are in<br>close relationship to the Dalma trap.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | Singhbhum.—As in Mánbhum, nests of very pure haematite occur in the Dalma trap dyke. The ores smelted are chiefly from ferruginous schists, and from the laterite. The most promising ores, however, are to be found in a number of lodes or veins in the transition rocks near, and west or>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                       | Chaibasa. Some of these are manganiferous.<br>Loh&rdaga.—There is a remarkable abundance of ores in the Palaman<br>subdivision, which includes magnetite in the metamorphic rocks; klac <sup>8</sup> -<br>band, limonite and haematite in a well-defined zone of ferruginous shales<br>in the Barakar group of the Aurunga coal-field, and to the north, ot<br>Balunagar; and, thirdly, red and brown haematite in the laterite. I ne<br>magnetic ores are not very important, and the lateritic ores, although plen-<br>tiful and of excellent quality, are found on the tops of lofty plateaux, where<br>they are practically almost inaccessible. The Barakar ores, however, are<br>both favourably placed and abundant, and excellent crystalline limestone<br>occurs in the immediate vicinity of the coal-field. There is some doubt<br>about the quality of the coal, but should railway communication with the<br>district be established the position will probably attract attention as a site<br>for iron-works.<br><i>Tributary StatesIn</i> the Tributary States of Chutia Nagpur iron<br>smelting is carried on to some extent.<br><i>Ddrjiling.—K</i> valuable bed of extremely pure magnetite, with some<br>micaceous haematite, occurs in the metamorphic rocks near Sikbhar, about<br>5 miles south-east of Kalingpung. The magnetite has been smelted on a tri-<br>fling scale, and is said to yield a steely iron suitable for making <i>kukris</i> and<br><i>bans</i> . There is a strong ferruginous band in the tertiary sandstones ot<br>Lohargarh hill, from which an immense supply of ore might be obtained;<br>but it is of very indifferent quality. |
| Assam.<br>462         | ASSAM.<br>$w \mid y^{Kl} \& i \sim 7^{aintia} $ #»H*Inm used to be made in the Khási-Jaintia<br>nins, but the manufacture has completely died out. The ore employed was<br>$\ll .F^{t \wedge n} \cdot I^{erous}$ , "I <sup>a</sup> gnetite, occurring in the form of minute grains dissemi-<br>nated through decomposed granite. The soft friable rock was raked into<br><b>1.</b> 462                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| ******* | <br> | <br>Iron | Ores of | Inc | dia. | <u></u> | (F. | <i>R</i> . | Mallet.) | IRON. |
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|         |      | <br>     |         |     |      |         |     |            |          |       |

a narrow channel with a rapid current of water running down it, and the **IRON** ORES. heavy ironsand caught by a small dam, while the lighter particles were washed away. After further purification by re-washing, the ore was smelted, and vielded an iron which, after refining more than once by reheating and hammering, was of excellent quality.

*Ndga Hills.*—In former times nodules of clay-ironstone, occurring in the tertiary coal-measures of the Naga hills, were smelted for iron, and during the most flourishing period the outturn must have been very considerable. As long ago as 1841 the manufacture was all but extinct, and has, for many years, been wholly so. In some localities impure limonite is very plentiful in the Siválik strata, but the ore is of poor quality.

Manipur.—In more than one locality in the valley of Manipur, a layer in the alluvium, occurring a few feet below the surface, is utilised as a somce'cf iron. The clay, which contains small pisolitic nodules of limonite, is washed to separate the latter, which are afterwards pounded and smelted. Titaniferous iron ore is said to be obtained in some of the The peculiar furnace used in Manipur has been alluded to streams. previously.

## BURMA.

Upper Burtna.—A very large proportion of the iron used is smelted in the country around Puppadoung, an extinct volcano about 30 miles southeast of Pagan, ferruginous concretions, occurring in the tertiary strata, are employed as ore, and the iron produced is of excellent quality. The furnaces are peculiar in being worked by a natural draught only, no bellows being used. Iron is also smelted at Maldu, a good distance north of Shue-bo-myo. To the west of Sagain, for miles of the Irawadi, rich haematite is said to abound.

Iron ore is reported to be very plntiful in the Shan States, and within the last year, the occurrence of an enormous deposit of haematite near Sengaung in the vicinity of Myit-nge, in the Shan hills, has been brought to notice.

*Pegu*,—Limonitic concretions in the newer tertiary strata in eastern Prome furnish excellent ore, which was smelted on a considerable scale prior to the British occupation of the province.

Tenasserim.—East of the Sittaung the ore usually met with is magnetite, which often occurs in thick beds or lodes; but specular iron is also found. The lower ranges of hills to the east of Shue-gvin station are said to contain abundance of ore.

Between Maulmain and Tavoy seventeen localities have been noted where iron ore occurs in the hiJls of tertiary strata. The best locality, however, with respect to quantity, quality, and position, is one near Tavoy. On the right bank of the river, opposite the town, runs a range of low hills at a distance from the river varying from 1 | to 3 miles, and extending to a distance of 5 or 6. These are said to be formed almost entirely of magnetite, the supply of ore being inexhaustible.

Some 10 miles south-west of the town of Mergui, there is an island, comprising a hill about 200 feet high which is said to be formed of iron ore. A similar island is reported to exist 4 miles to the southward of the first mentioned. Magnetite and haematite have been noticed on an islet between King and Tawlang islands. Limonite is stated to occur in some abundance at Podan-or.

## ANDAMAN ISLANDS.

Within the last few years haematite has been discovered at Rang-u-Chang, a place some miles south of Port Blair; but it is not very abundant, and is mixed with too much quartz and pyrites to be of any value. 33 .

BURMA. 463

Andaman Islands. 464

Assam\*

| IRON.                       | Prospects of Iron Manufacture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROSPECTS<br>of the<br>IRON | GENERAL SUMMARY OF PROSPECTS OF IRON MANU-<br>FACTURE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| INDUSTRY.<br>465            | The following summary by Sir G. M ofesworth, written in 1882, way be here quoted in entirety, giving, as it does, the unbiassed opinions of a careful and competent expert :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                             | "It appears to me to be doubtful whether iron manufactured from<br>charcoal will be produced at rates sufficiently low to compete with English<br>manufacture; but if practicable, it must be combined with a Very perfect<br>and well-organised system of forest conservancy in a <i>district capable of</i> .<br><i>producing timber of a quality eminently suited</i> for the manufacture 01<br>charcoal fit for smelting operations, at a low price; and the timber must<br>be in a position near the iron works, as charcoal is bulky and consequently<br>expensive in carriage, and the expense of carrying ore and flur "?. <sup>a</sup> PX<br>great distance would be very great." Abstracting the information which i<br>have given above as bearing on the economic manufacture of iron, I arrive<br>at the following conclusions :—<br>In the Panjab and Sind the scarcity of fuel is an insuperable obstacle.<br>In the North-West, after a patient trial, iron manufacture has not been<br>successful, and Mr. Bauer man reports against the probability of success.<br>In the Central Provinces, Jubbulpore and Chanda afford very fair<br>promise of success.<br>In Central India the Gwalior iron-field may possibly be successful:<br>but the absence of coal and the distance of the forests militate <sup>a</sup> £ <sup>a</sup> ! <sup>n</sup> ?!<br>success. At Berwai the failure has been without a fair trial, but the late |
| -                           | success. At berwal the failure has been without a fair that, but the fate<br>enhancement of the price of fuel renders its success doubtful.<br>At Rewah there appear to exist elements for success; but works in thi<br>district would naturally be combined with the Jubbulpore works.<br>In Rajputana and Bombay Presidency the scarcity of fuel and com-<br>petition with England appear to preclude the establishment of iron-work <sup>6</sup><br>on a large scale.<br>In Bengal the Bengal Iron Works appear to hold out promise of suc-<br>cess, but other localities in that district, so far as they have been examinea,<br>do not appear to hold out any such promise.<br>In Orissa the coal is too poor to hope for success.<br>In Assam the ore where abundant is not sufficiently rich, and in the<br>coal measures where it is rich, it is not in sufficient abundance.<br>In the Nizam's Dominions the ore and fuel are not in juxta-position<br>so far as is known at present.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                             | In Madras the scarcity of fuel prevents the utilisation of most valuable<br>ore.<br>In Burma there appear to be elements for the production of iron, but<br>the market will doubtless be limited.<br>Taking all these circumstances into consideration, we can only, in the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| IRON<br>WORKS.<br>466       | present state of our knowledge, assume three centres as the <i>probable</i> fields<br>for iron industry on a large scale by the agency of English capital, w.«—"<br><i>1st</i> —The Bengal Iron Works,<br>2wrf—The Jubbulpore District,<br>jrrf—The Chanda coal and iron fields."<br>IRON WORKS AND FOUNDRIES.—Mr. <b>O'Conor,</b> in his Statistical<br>Tables for British India, 1888-89, gives a list of forty-seven iron and brass<br>foundries, of which eight are in Bombay, three in Sind, five in Madras,<br>seventeen in Bengal, one in Lower Burma, two in the North-West Pro-<br>vinces and Oudh, and eleven in the Panjab. Of these the most important<br>are the Barrakar Iron Works, and Burn and Co.'s Iron Works in Bengal,<br>the Byculla Iron Works, Bombay, and the Iron Foundry and Ship-build-<br><b>1. 466</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| • Trade in Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | IRON.                      |
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| ing Yard, Rangoon. <sub>c</sub> The total number of persons employ<br>between 12,000 and 13,000.<br>USES.—It is needless to enter into a consideration of<br>methods of application of this invaluable metal which d<br>worthy manner differ in India from those followed in oth<br>methods of utilisation of the chief ores and salts will<br>below*<br>TRADE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | the multitudinous<br>o not in any note-<br>er countries. The                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | IRON ORES.<br>Uses.<br>467 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | two hoodings T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |
| The trade in iron and steel may be considered under<br>Internal, II, External,.<br>I. INTERNAL.—The total rail and river transactions<br>past year amounted to 49,37,135 maunds, valued at H<br>arge&w exporters were Bombay with 17,65,925 maund<br>13,57,136 maunds; Madras seaports with 5,67,774. mau<br>with 5,02,873 maunds; Bengal with 1,64,779 maunds;<br>sidency with 1,47,551 maunds. The largest importing<br>bay Presidency with 10,42,159 maunds ; the Pan jab with<br>Bengal with 6,90,450 maunds; the North-West Pro<br>with 6,16,118 maunds; Madras with 4,47,911 ma<br>and Central India with 2,61,185 maunds; and the<br>with 2,38,117 maunds. %<br>The coasting trade returns for the same year differ<br>Foreign iron. The imports of the former amounted to<br>at R99,561. The largest importer was Bombay with<br>R44,718; followed by Madras with 3,744 cwt., Bengs<br>Burma with 921 cwt., and Sind with 891 cwt. Of the<br>6,553 cwt. was received from British Ports within the Pre<br>from Goa, and about 1,000 cwt. from Kathiawar, Kach, a<br>Territory. Madras received its supply almost entirely<br>Bombay; Bengal was supplied altogether by other Br<br>the Presidency; Sind received nearly the whole of its sup<br>and Burma from Bengal. The exports coastwise for t<br>returned as 32,634 cwt., or nearly double the imports,<br>be assumed that the period of most active trade nearly<br>time of returning the trade figures. Of these, Bombay<br>exported 30,915 cwt., 11,879 °* which was destined for<br>have been on its way at the time of compilation of the i<br>94,270 cwt. Bombay followed with 74,414 cwt., then Sind v<br>with 31,641, and Bengal with 22,275 cwt. Of the Mad<br>cwt. was derived from Bombay, 21,729 cwt. from British<br>Presidency, and smaller quantities from Bengal and Bu<br>whole of the Bombay imports were derived from other F<br>the Presidency. Those of Sind with the exception o<br>from Bombay, those of Burma from Bengal, Bombay,<br>Ports within the Presidency, and those of Bengal from | in iron during the<br>2,22,60,226. The<br>ls; Calcutta with<br>nds; and Karachi<br>and Bombay Pre-<br>centres were Bom-<br>17,08,147maunds;<br>vinces and Oudh<br>unds; Rajputana<br>Central Provinces<br>entiate Indian and<br>6,400 cwt., valued<br>8,701 cwt., valued<br>8,701 cwt., valued<br>8,701 cwt., valued<br>1 with 2,143 cwt.,<br>9 Bombay imports,<br>sidency, 1,115 cwt.<br>und the Gaekwar's<br>from Bengal and<br>itish Ports within<br>ply from Bombay,<br>he same year were<br>from which it may<br>corresponds to the<br>is shewn as having<br>or Sind, and must<br>mport figures.<br>the same year was<br>2,455 cwt., value<br>nport into Madras<br>vith 39,855, Burma<br>as imports 60,128<br>1 Ports within the<br>rma. Nearly the<br>critish Ports within<br>f a few cwt. came<br>and other British |                            |

The export table for the same year again, probably for the same reason, shews a considerably larger trade, amounting to 332,094 cwt., valued at R19,20,168. Of this a very large proportion, *viz.*, 244,114 cwt. was shipped from Bombay, chiefly to British Ports within the Presidency, Madras, Kathiawar, and Sind.

The coasting trade in steel is unimportant, the imports in 1888-89

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| IRON.                   | Trade in Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |  |  |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|
| TRADE.<br>Internal.     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  |
|                         | 1886-87       Cwt.         1887-88       94,626         1887-88       11,17/tf <sup>1</sup> 12,95,822         1888-89       154, <h3< td=""></h3<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| External,<br><b>469</b> | The chief importers, in the year under consideration, were Burma with<br>71,741 cwt., the country supplied by the Sind-Pishin Railway with 54/**<br>cwt., Nepal with 12,769 cwt., Kaslqpu'r with 8,322, and Kabul with 5,7 <sup>20</sup><br>cwt <sup>m</sup><br>The trans-frontier imports into British India are small, unimportant, at<br>shew no tendency to increase. They amounted in 1888-89 to 2,818 ches<br>of which 1,590 came from Nepal, 677 from Upper Burma, 5°9, °y<br>Sind-Pishin Railway, and a few cwt. from Bajaur, Thibet, and Bhutan.mu-<br>2. EXTERNAL.— <i>Imports.</i> —The import trade in iron and steel, ma 'id<br>factured and unmanufactured, is one that has naturally undergone a rails<br>and steady increase with the development of spinning and weaving <sup>-m</sup> up<br>and of railways in India. It is impossible, from the statistics available the<br>give an exact representation of the actual amount imported, since, in <sup>de</sup> ~ -<br>headings " Railway Plant and Rolling Stock," "Machines and Macnin f<br>ry," and "Hardware and Cutlery," other metals and manufacturesel<br>wood are included. But figures shewing the development of these, as 'e ^<br>as of the imports of the iron and steel imported into the country |  |  |  |  |  |  |  |  |  |
| ,                       | 1881-82 to 1885-86       241,900       10,74,030         1886-87       349,317       20,98,619         1887-88       420,927       25,88,107         1888-89       542.388       34,45,892         • Years 1871-72 to 1874-75 include cutlery and hardware, thereafter excluded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
|                         | <ul> <li>Fears 18/1-72 to 18/4-75 include cutery and hardware, thereafter excluded.</li> <li>T 4/0</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |

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|                                                                                                                                                                                                   | Tra     | de in Ir | on.   |   |   | <b>(J</b> . Murray.)                                                                                                                               | IRON.     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|-------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| HARDWARE AND CUTT                                                                                                                                                                                 | LERY—   |          | _     |   |   |                                                                                                                                                    | TRADE.    |
| 1875-76<br>1876-77 to 188081<br>1881-82 to 1885*86<br>1886-87<br>1887-88                                                                                                                          | • *     | · · ·    | · · · |   |   | .47>53,383<br>.45,96J7>0<br>.77»06,770<br>.86,53,973<br>.1,09,39,396.                                                                              | External* |
| 1888-89                                                                                                                                                                                           |         | •        |       | - |   | 1,10,22,046                                                                                                                                        |           |
| MACHINERY AND MIL                                                                                                                                                                                 | LWORK—  |          |       |   |   | R                                                                                                                                                  |           |
| 1850*51 to 1854*55.<br>1855-56 to 1859-60.<br>1860-61 to 1864-65.<br>1865-66 to 1869-70.<br>1871-72 to 1875-76.<br>1876-77 to 188081.<br>1881-82 to 1885-86.<br>1886-87.<br>1887-88.<br>1888-89 • | •       | •        | • •   | • | × | 4,81,100<br>52,08,990<br>61,40,630<br>72>32,230<br>90,06,214<br>78159,004<br>1,36,56,374<br>i,37, <sup>1</sup> 4,59i<br>1,80,02,178<br>2,31,68)714 |           |
| RAILWAY PLANT AND                                                                                                                                                                                 | ROLLING | STOCK-   | -     |   |   | R                                                                                                                                                  |           |
| 1871-72 to 1875-76.<br>1876-77 to 1880-81.<br>1881-82 to 1885*86.<br>1836-87                                                                                                                      | ••      | •        | *     | • |   | .48,44,664<br>95,95,112<br>1,48,793824<br>1,43,5',244                                                                                              |           |
| 1837-88<br>1888-89                                                                                                                                                                                | · ·     | •        | •••   | • | • | 2,57,76,029<br>.2,49,32,389                                                                                                                        |           |

To the above figures must be added the raw and manufactured metal imported by Government, which represents a considerable sum and has largely increased during the same period. In the year under consideration these imports were as follows:—

|                                     |   |   |   |   |   | Cwt.        | ft                    |
|-------------------------------------|---|---|---|---|---|-------------|-----------------------|
| Iron • • •                          |   | • | • | • | ٠ | 288,611     | 18,30,488             |
| Steel • •                           | • | ٠ | ٠ | • | ٠ | 20,464      | 1,53,448              |
| Railway plant, &c<br>Machinery, &c. | ٠ | • | • | • | • |             | 74,91,809<br>5,61,664 |
| Hardware and Cutlery                | • | • | • | • | • | <b>64</b> I | 7.72.267              |
| fund white and Cattery              | • | • | • | • | • |             | 19292                 |

A review of the above figures reveals the fact that during the past eighteen years the imports of iron have doubled, both in quantity and value, while those of steel have increased more than fifteen times in quantity, though only four times in value. The imports of Hardware and Cutlery have increased in value more than twice in the same period, while those of Railway plant and rolling stock have increased five times. The development of the imports of machinery from about 5 lakhs in 1850-51 to nearly 2} crores in 1888-89 is a startling testimony to the enormous advance made by steam power in India during a period of less than forty years. Though the above facts point to increased mercantile and industrial activity and prosperity, they at the same time accentuate the fact that no practical development in iron-making has as yet been made in India. As already shown, in the Barakar works and elsewhere, an important industry might be created, but up to this time the production of Indian metal is limited to trifling quantities of cast iron,-and that, notwithstanding the fact the Government and the public require and import close on a quarter of a million tons of iron and steel yearly, without including the enormous amount imported as machinery, railway plant, &c. In connection with this subject it may be noted that the increase in cost of all machinery, railway plant, and other manufactured iron from freight is very large. This is well shewn in a series of tables recently compiled by Mr. E. H. Stone, Assistant Secretary, Railway Branch, Public Works Department, shewing the cost of the material for one mile of single track, of the several

| IRON.                                                 | Trade in Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TRADE.<br>External.<br>Analysts of<br>Imports.<br>470 | forms of permanent way in India. One of the<br>ample. The cost, free on board at the port<br>required for one mile of single track of a per-<br>gauge, with flat-footed steel rails 8ofc per yar<br>is £2,020-8-11. The charges for freight and<br>£318-1-4, and the landing charges in India<br>cost delivered in India, converted to Indian<br>6d. to the rupee, 831,835. Further, the cost<br>railway for every 100 miles is shewn to vary<br>ing to the railway on which carried. The<br>possibilities of large profit, supposing that as<br>tured in England could be made in India at<br>On this subject Mr. Stone has kindly furnis<br>•• Assuming that the cost of production we<br>ment to the capitalist would be that he could<br>as his English competitor, plus an enormous<br>the cost of carrying the English-made materi<br>if the quality were in both cases the same, R<br>dian firm if they could get rails delivered at<br>get them delivered by the English firm. I<br>charge anything they liked, provided their<br>than English charges plus carriage to Ind<br>there is of course a good profit to begin wi<br>saving cost of carriage is extra profit." Fro<br>pear that, with good and experienced mana<br>obtaining good fuel, the iron industry in In<br>enormous development.<br>ANALYSIS OF IMPORTS.—The total imp<br>under consideration were made up as follows | in England,<br>rmanent way 3<br>rd, on cast iron<br>l insurance on<br>a to R655, ma<br>currency with<br>of carriage of th<br>from R900 to<br>se figures pla<br>good rails as t<br>anything like t<br>shed the followi<br>ould be the sar<br>d sell rails at t<br>s extra profit<br>al to India. I<br>cailways would<br>t a lower rate t<br>Hence the Ind<br>charges were<br>lia. In the F<br>th,—the profit<br>om these notes<br>agement and a<br>dia ought to | of the material<br>5 feet 6 mcness<br>bowl <sup>slee</sup> P* <sup>r</sup> , <sup>s</sup> ,<br>this amoun11<br>king the tota<br>exchange 1.<br>atfmatenai DY<br>81,858 <sup>acc0</sup> Vg<br>inly shew the<br>hose manuta-<br>he same proper-<br>ne, the <sup>induc</sup> C<br>he same proper-<br>represented vy<br>n other worass<br>buy of the in-<br>han they <sup>cou</sup> 1<br>ian firm cow<br>something -<br>to be <sup>ma</sup> * J <sup>e</sup> -<br>it would ap<br>a possibility<br>be capable<br># |
|                                                       | DESCRIPTION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Cwt.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                       | Old iron for re-manufacture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 7.729<br>138,542<br>1,235,814<br>442,160<br>486,655<br>360,603<br>111,589<br>25,957<br>144,064<br>u,616                                                                                                                                                                                                                                                                                                                                                        | 16,573<br>3»47»74*<br>63.43,693<br>21,67,543<br>30,74,63s<br>36,46,909<br>6,15,030                                                                                                                                                                                                                                                                                                                                                                                                                            |

Straits, and Austria, named in order of importance.
The old iron was obtained almost entirely from Ceylon, the cast iron altogether from the United Kingdom, the other descriptions almost en\* tirely from the United Kingdom and Belgium.
Ur the total Bombay imported 1,630,152 cwt.; Bengal, 147\*\*9^4 cwt.; Madras 444.088 cwt.; Burma, 270,827 cwt.; and Sind, IS4.79<sup>2 cwt</sup>. Per-I. 470

| Trade in Iròn. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | IRON.                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Trade in Irôn.       (J. Murray.)         haps the greatest increase has taken place in galvanised iron, and piping and tubing. The former is now largely utilised for roofing sheds and workshops in the plains, and residences in the hills. The increase in the latter has been brought about by the constant progress of waterworks and drainage schemes in municipal areas.         Of the total imports of steel, 137,108 cwt. consisted of "hoop" which is now largely replacing iron hoops for all purposes, markedly so for binding bales of rotton, &c. Of the remainder 32,201 cwt. consisted of "cast steel," and 373*070 was returned under the miscellaneous heading of "other sorts."         Here, again, as in iron, the United Kingdom was the chief source of supply, contributing 456,550 cwt. out of the total. Belgium came next with 7,976 cwt., followed by Germany with 7,063, and the United States, Franca, and other countries with small and unimportant quantities.         The chief importer of steel was Sind, with 212,595, followed by Bombay with 165,476 cwt. Bengal with 136,160 cwt., Madras with 22,065, and Burma with 6,092 cwt.         The hardware and cutlery came almost entirely from the United Kingdom, which furnished an amount valued at 899,23,931, out of the total on lakhs. Austria, Belgium, Germany, and the Straits Settlements contributed to the value of {^3,26,873, R2,45,318, R 1,55,408, and R 1,1,2,404, respectively. Bombay imported to the value of 65,297,815; Bengal, R31,59,ni; Burma, R 12,05,248; Madras, Rq.,03,773; and Sind, R4,56(209).         The machinery and millwork came almost entirely from the United King, dom. Bombay imported Ri,12,05,1630f steam machinery and R8,222 of other sorts; Bengal, 810,89,867 of the former and 875,41*341 of other sorts: 680(23,427; materials for construction, cc, ex or 37,66,78. Bengal imp | IRON.<br>TRADE.<br>External* |
| Sind small quantities.<br>The comparatively large re-export of hardware and cutlery took place                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                              |
| I. 470                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              |

## Dictionary of the Economic

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|                            | Trade in Iron.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|
| TRADE.<br>External.<br>471 | almost entirely from Bombay to the United Kingdom, the East Coast of<br>Africa, the Straits Settlements, Persia, and Turkey in Asia.<br>EXPORTS.—The exports of Indian iron and ironwork are naturally, from<br>the very backward state of the iron industry in the country, very «na» a <sup>n</sup><br>unimportant.<br>In the past five years they have been as follows :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |  |
|                            | Iron. Hardware Machiner<br>and Cutlery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |
|                            | 1884-85       Cwt.       R       R       2,107         1885-86       5,71M       50,440       42,707       2,107         1885-86       6,480       59,213       70,877       1,443         1886-87       7.329       61,901       65,955       3,137         1887-88       5.375       47,818       67,086       878         1888-89       6,406       62,170       93,609       1,757                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |  |
|                            | The above figures have been enumerated, not so much for the value o<br>the trade, which, indeed, is almost unworthy of anything but a passing men<br>tion, as for the sake of comparison with the large figures of the impor<br>trade. It is unnecessary to go into a detailed account of the ports export<br>ing and receiving these small quantities, but it may be mentioned tha<br>Bombay is the largest exporter, and that the trade is almost entirely with<br>small Eastern ports. In the case of hardware and cutlery, however, the<br>United Kingdom in 1888-89 imported goods to the value of R3 <sup>6</sup> * <sup>01</sup> *-                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |
| 472                        | Iron Qxides, Ball, Geology of India, III., 416.<br>Vern.—Rust or impure red oxide of \ron=* L6he'ka-gang, 16M-ka-g&, V <sup>14</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |
| •                          | <ul> <li>HIND.; Lohdr-g4₁ fohdr-fhangår, SENG.; Lokhan~dhdcha-katai, ***?]<br/>Lohanwzang, Guz.; Ayach-chenduram, irumbu-chittam, TAM.; I<sup>na</sup>f<sup>6</sup><br/>chittam, aya-shinduramu, TEL.; Khabbanada-kittd, KAN.; IruntouK<br/>kit am &gt; MALAY.; Sdnpiyd, tdmbiyd, sdnkki, tdnkhi, BURM.; Y****<sup>41</sup><br/>kittam, mallokodd, SING.; Manauram, SANS.; Khabsul-hadid, gafara.<br/>nul-hadid, ganj drul-hadid, ARAB. ; Zange-dhan, chirke-dhan, rifij<br/>dhatty gangdre-dhan, PERS.</li> <li>Red ochre^geru, hirntji, HIND.</li> <li>Yellow ochre=Rdtnrqf, haldimdti, HIND.</li> <li>Magnetic oxide of Iron, or loadstone<sup>TM</sup> Chamak-kd-patthar, chatnak, HIND,<br/>MiqndHs, mighndtts, hajrulmighndtis, ARAB.; Sange-dkanrubd, sang*<br/>chamak, PERS.</li> <li>References.—Pharm. Ind., 366, 367; Ainslie, Mat. Ind., 522; Moodeel<br/>Sheriff, Supp. Pharm, Ind., 140, 141; U. C. Dutt, Mat. Med. Hind.<br/>46-54; McLann, Dyes and Tans, Beng., 32, 33, 68, 91; Buck, Dyes and</li> </ul> |  |  |  |  |  |  |  |
| LOCALITIES.<br>473         | Tans, NW. P., 42; Balfour, Cyclop. II., 375><br>Occurrences.—Iron ochre, consisting of the earthy varieties of th<br>haematites, occurs abundantly in India, as a necessary consequence of th<br>wide distribution of iron ores and laterite. The following localities, however<br>are mentioned by Ball as the sources from which it is principally obtained<br>—Madras,—Trivandpuram in Trichinopoly, various localities in the Nil<br>ghiris: Bengal,—the Rájmahal and Kharakpur hills: Central Provinces,—<br>Madnapur and Thakurtola in Raipur, the Salitikri hills in Balaghat                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |  |

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| Iron Oxides.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>(J.</b> Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | IRON<br>Oxides.                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Dye and Pigment.—The ochres, both yellow and<br>employed in many localities for the adornment of the v<br>houses, by Hindus for painting caste-marks on the fore<br>the clothes of certain castes, and for other similar purposes<br>writes in his Dyes and Tans of the North-Western Provin<br>stance (geru) is found in some parts of these Provinces, a<br>ported from Gwalior. It is much used by fakirs and as<br>their clc+hes of a dull orange colour, but plays a more of<br>part in the hands of the dyers in the production of sex<br>colours. The earth is simply pounded and mixed with v<br>the cloth is dipped. Red ochre of a lighter colour than,<br>hirmji, while yellow ochre is occasionally used as a dye<br>of ratnraj." He then gives the following examples of dy<br>geru:—In Allahabad a buff colour known as Geru, is<br>ochre and alum; in Cawnpore a dove grey called Faktd<br>the same oxide with myrobalan, sulphate of iron and a<br>lahabad a purple called Nafarmani, is produced by red<br>and indigo. Geru is also used in calico-printing.<br>At Jauti or Jauli in Jabalpur large mines of massive<br>been leased by Mr. W. Q. Olpherts for the purpose of<br>mineral paint, prepared by grinding the ores to an im<br>between stones worked by water-power. Ball states tha<br>#rote, the value per ton in London was $\pounds g-10$ —retail £13<br>paint has proved to be the cheapest in the Indian marked<br>on wood or iron, and has been successfully used against<br>tiles, bricks, and plaster. It is now used by the principal<br>ship Companies, and has stood a practical test on the n<br>principal bridges in India; it has been found most useful<br>boilers. In the preparation of one cwt. of paint, ready fo<br>ing components are required: Dry oxide of iron, 65 jib, H<br>Ions. The addition to the oil of one-fourth of its weight or<br>resin renders the colour more brilliant and lasting. Three<br>coat and two pounds for a second are sufficient to cove<br>feet on an average" (Ball) | valls of huts and<br>ehead, for dyeing<br>. Sir E. C. Buck<br><i>nces</i> , "This sub-<br>and is largely im-<br>cetics for dyeing<br>or less important<br>veral well known<br>water, into which<br><i>geru</i> is known as<br>under the name<br>yes produced by<br>roduced by red<br><i>i</i> , is produced by<br>lum; and in Al-<br>ochre, safflower,<br>e haematite have<br>manufacturing a<br>palpable powder<br><i>t</i> , at the time he<br>b. "This mineral<br><i>t</i> , it lies smoothly<br>damp on porous<br>Rail and Steam-<br>netal work of the<br>on the inside of<br>r use, the follow-<br>inseed oil 5^ gal-<br>of common bazar<br>pounds for a first | DYE ft<br>PIGMENT,<br>474                                                                                           |
| feet on an average" (Ball).<br>Medicine.—A yellow impure OCHRE is believed in Sik<br>for goitre.<br>The MAGNETIC OXIDE is used in doses of from five to<br>tonic and hsematinic. It is highly esteemed as a medicine<br>lities, e.g., Mysore, where a drinking cup of magnetic o<br>mended to the late Raja by his native physicians. They he<br>ing out of it he would prolong his life. In the same distr<br>that milk, if boiled in such a cup, cannot flow over.<br>HYDRATED PEROXIDE of iron is employed in doses of fiv<br>or more as tonic, emmenagogne and anthelmintic, and r<br>is a valuable antidote in cases of arsenical poisoning. In<br>a mixture of the proto- and per- oxides is largely administ<br>from six to twelve grains in many diseases, under the<br>reality powdered and refined iron. The following accound<br>U. C. Dutt:—"Three varieties of iron are used in H<br>namely, kanta lauha or cast iron, mandura or iron rust, a<br>salts of iron, produced by iron being kept in contact with<br>The form of cast-iron used in the manufacture of pans<br>is considered superior to all others for medicinal use. Th<br>of iron which are scattered around when hot iron is bea<br>are called man dura. They are allowed to remain in<br>earth till they become very rusty and brittle, when they are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ten grains as a<br>in various loca-<br>xide was recom-<br>eld that by drink-<br>ict it is believed<br>ve to thirty grains<br>nixed with water<br>Hindu medicine<br>tered in doses of<br>idea that it is in<br>unt is given by<br>Hindu medicine,<br>and <i>lauhasara</i> or<br>vegetable acids.<br>for boiling milk<br>te small particles<br>ten on the anvil,<br>contact with the                                                                                                                                                                                                                                                                                  | MEDICINE.<br>Yellow Ochre.<br><b>475</b><br>Magnetic<br>Oxide.<br><b>476</b><br>Hydrated<br>peroxide.<br><b>477</b> |

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| IRON<br><b>Pyrites</b> ,  | Iron Oxides and Pyrites.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE.                 | use. The properties of <i>mandura</i> are said to be analogous to those of cast <sup>**</sup><br>iron. "^ " Cast-iron is purified by beating it into thin plates, heating the<br>plates in fire, and sprinkling them with cow's urine, sour congi oil, and a<br>decoction of the pulse Dolichoa biflorns (kulattha) seven times in success<br>sion. The plates are reduced to powder by pounding them in an iron ""~<br>tar, rubbing them with cow's urine, and roasting the mixture in a covered<br>crucible repeatedly till it is reduced to a fine impalpable powder, that will<br>float on water and will not irritate the eyes when applied to them, It is usual<br>to rub the iron with cow's urine and roast it about a hundred times in suc-<br>cession. In some cases it is recommended that iron should be thus roasted<br>separately for a thousand times. Mandura is purified and prepared for <sup>*</sup><br>use in the same way. Prepared iron is a fine impalpable powder of a<br>reddish-grey or brick-dust colour." This preparation of iron oxicjes was<br>believed by the practitioners of Sanskrit medicine to increase strength,<br>vigour, and longevity, to cure all sorts of diseases, and to be the best or<br>tonics. Dutt writes, "When gold and silver are not available, iron, is<br>substituted for them. It is used in painful dyspepsia, chronic fever, phthi-<br>sis, anasarca, piles, enlarged spleen and liver, ansemia, obesity, urinary<br>diseases, diseases of the nervous system, skin-diseases, &c. When iron is-<br>^ administered, the following articles of diet should be avoided, namely,<br>* kushmanda (fruit of Benincasa cerifera, Savi), sesamum oil, kulattfra<br>(pulse of Dolichos biflorus, Linn.), mustard, wines, and acids."<br>The above described preparation of iron oxides enters into many com-<br>plex preparations, in which it is combined with the other metals, spice*,<br>aromatics, and other vegetable drugs* Each preparation is supposed to<br>have specific virtues, and is specially employed for certain diseases. It,<br>needless in such an article as the present to enter into a detailed description<br>of these, for which the reader may be referre |
| 478                       | Iron Pyrites, Ball, GeoL of India, III., 418.<br>SULPHIDE OR SULPHURET OF IRON   FeS <sub>2</sub> ,<br>Vern.—Rupamakhi, HIND.; Kangsmuki, BHNG.; Swarna mukhi, MAR* 7<br>Surna muki, sonmakki (more properly applied to copper pyrites), MAD-<br>RAS; Svarnamakkshika, tdramakshika, SANS.<br>,<br>Poforomono f C Dutt Mat Mad Hind 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| localities.<br><b>479</b> | Reference.— $\pounds/.$ C. Dutt, Mat. Med. Hind., 56.<br>Occurrences.—This ore is widely distributed through formations of vari-<br>ous ages. Thus it occurs in quartz reefs associated with the ores of other<br>metals, and often with metallic gold, and is also to be found in slates,<br>limestones, coal, and in the extra-peninsular tertiary rocks, e.g., the<br>nummulitic formations of Sind. Though it is possible that this ore may<br>occur in considerable abundance, and, indeed, it is stated that it does so-<br>in the Rhima limestones of the Deccan, still it appears probable that the<br>supplies of Indian pyrites are not easily accessible, and are unlikely to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| MEDICINE.<br>480          | become of commercial importance. At the present time the chief supply is<br>imported into Calcutta from Arabia, where it is obtained on the surface<br>and in the beds of rivers.<br>In the Calcutta market, the wholesale value is said to be R6 to Rio a<br>maund. It is used almost entirely as a drug ( <i>Ball</i> ).<br>Medicine.—Dutt writes, <sup>M</sup> Iron pyrites has been used in medicine from<br>a very remote period. It occurs in two forms, namely, in dark yellow<br>nodules with a golden lustre, and in silvery 'radiating crystals. The<br>former is called <i>Svarnamdkshika</i> , and the latter <i>Tdramdkshika</i> . The<br>ancients supposed that they contained gold and silver respectively, in<br>combination with other ingredients, and possessed in part the properties<br>of those precious metals. Iron pyrites is purified by being boiled in<br><b>I.</b> 480                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

I. 480

| Sulphate of Iron*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (J. Murray.)                                                                                                                                                                                                                                                                                   | IRON<br>Sulphate |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| lemon juice with one-third its weight of rock-salt in ar<br>pot becomes red-hot. It is reduced to powder by be<br>or goat's urine, and then roasted in a closed crucib<br>it has a sweetish bitter taste. It is considered tonic, a<br>in anaemia, urinary diseases, ascites, anasarca, prurig<br>As an alterative tonic it is generally used in com<br>and in the medicines of its class such as iron, talc, me                                                                                                                                                                                                                                                                                                                                                                                                                       | eing rubbed with oil<br>le. Thus prepared<br>lterative, and useful<br>o, eye-diseases, &c.<br>ibination with other                                                                                                                                                                             | MEDICINE.        |
| <ul> <li>ron Sulphate, Ball, Geol. of India, 419.</li> <li>GREEN VITRIOL, GREEN COPPERAS, FERRIC</li> <li>Vern. —Kasis, hitd-kasis, kdki (kdki-mdti—sulphate<br/>5^0=impure green vitriol, kdhi*saféd=white and<br/>kaki-siyd*=b)aclt iron sulphate; kahi~Bard±*yellow<br/>sulphate), HIND. 5 Hird-kos, hird-kasis, BENG.; J<br/>BOMB.; Hira-kasis, Guz.; Anna-bedi, TAM.; Anna<br/>KAN.; Kasisa (dhdtukdsis*=green variety, phus<br/>variety), SANS.; Zdje-a&amp;far, ARAB.; Zdke-zard, PH<br/>References.—Mason, Burma &amp; Its People, 56*, 730<br/>/., 529; O'Shaughnessy, Beng. Dispens., 352; M<br/>Pharm. Ind., 141; U. C. Dutt, Mat. Med. Hind<br/>and Tans, Beng., 3, 17, 42, 132, 134, 135&gt; 13S, 140,<br/>162, 169; Buck, Dyes and Tans, NW. P., 41 / Lia<br/>128, 129, 130, 134; Balfour, Cyclop., II., 375-</li> </ul> | e of iron earth, k&hir<br>nydrous iron sulphate,<br>v variety of anhydrous<br>Kashish, hird-kashish,<br>t-bhedi, TEL., MALAY.,<br>hpa kdsis=» yellowish<br>ERS.<br>0; Ainslie, Mat. Tnd.,<br>oodeen Sheriff, Supp.<br>(,, 55; McGann, Dyes<br>,*4h *44> 49, no, 75'»<br>otard, Dyes, 116, 127, | 481              |
| Occurrences.—Ferrous sulphate occurs in the for<br>soluble in water. It is formed abundantly by nature<br>pyrites, and is apt to undergo a further alteration in<br>of the sesquioxide, or ferric sulphate. For use in th<br>a large scale by exposing moistened iron-pyrites to at<br>when the same changes which occasion its natura<br>Natural green copperas is to be found in many par<br>largely employed by natives for dyeing.                                                                                                                                                                                                                                                                                                                                                                                                 | al oxidation of iron<br>to the red sulphate<br>ne arts it is made on<br>mospheric influence,<br>l formation occur.                                                                                                                                                                             | LOCALITIE<br>482 |
| Dye*—This salt is used extensively in dyeing par<br>ducer, partly as a mordant. It is generally employed<br>substances to obtain various shades of black, brown, a<br>and green, and is also much used in calico-printing.<br>the natural copperas is employed, in others it is art<br>placing clean bars of iron in a tub containing a soluti<br>and other substances. Sir E. C. Buck states that the<br>is about four times that of the sugar dissolved, that w<br>become of a deep black colour it is ready for dyeing<br>myrobalans are occasionally added to clear the colour<br>A large trade is said to be carried on in the prepar<br>the dyer's use in Lucknow.                                                                                                                                                               | mixed with organic<br>grey, purple, violet,<br>In certain localities<br>ificially prepared by<br>on of coarse sugar<br>weight of iron used<br>hen the solution has<br>g purposes, and that<br>r.                                                                                               | DYE.<br>483      |
| Medicine.—Native sulphate of iron has been know<br>cine from a very early age, but its chemical nature<br>have been recognised by those who recommended i<br>rarely employed internally, but was much used externa<br>as an astringent, and was recommended as a strength<br>glandular structures. In European medicine it is v<br>chalybeate tonic, astringent, emmenagogue, antiperiodi<br>In large doses it is an irritant poison. Locally appli<br>astringent and stimulant.<br>The dried sulphate is employed for the same pu<br>styptic.<br>Other salts of iron, especially the persulphate, per<br>carbonate, pernitrate, citrate, acetate, arseniate, and<br>employed in European medicine, and are all manufact<br>directly or from some of its salts. In Indian medicin                                                      | does not appear to<br>ts use. It was only<br>ally in skin diseases<br>ening application to<br>alued as a powerful<br>ic, and anthelmintic.<br>ied it is used as an<br>rposes and also as a<br>rchloride, phosphate,<br>iodide, are largely<br>tured from the metal                             |                  |

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I. 484

| ISINGLAS              | The Woad ; Isinglass.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| MEDICINE.             | ture of the oxides already d<br>and it would be superfluous $ir/_1i^{J>ed}$ is $alm0St$ the $0n'yl^{form}$ of iron used<br>known properties to the above artificially-prepared salts.<br>(G. Watt.)                                                                                                                                                                                                                                                                                                                                  |
| 485                   | ISATIS, Zoom, Gen. Pl., I., 94.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4~3                   | Isatis tinctoria, Linn.; Fl. 163; CRUCIFERE.<br>THE WOAD OF DEVIL'S WEED.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| indigo.<br>486        | An erect, herbaceous plant, like a large cabbage, common in Westerf<br>Tibet, Afghánistan, &c., occurring both wild and cultivated. Also largely<br>grown in certain regions in China.<br>Yields the indigo of Chinz. Dr* Aitchison, in his report upon the<br>Kuram Valley, informs us that it is used for this purpose in Afghanistan.<br>For further particulars see the article on Indigofera tinctoria, pp. 387-469*<br>Also Four. AgriHorf. Soc. Ind. (Old Series), VIII. (Proc.), 180. XI.,<br>157, 158.                      |
|                       | ISEILEMA, Anders. (Anthisticia, Linn.); Gen. Pl., III., 1136.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 487                   | SynI. PROSTRATA, Andere                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FODDER.<br>488<br>190 | Vern.—Champ (Simin Hills), luinji (KANGRA), Chhat (RAWALPINDI),<br>gándi (HISSAR), PB.; Karar-gandhel-dungarko (JEYPUR); Musel, musiái,<br>machauri (LALITPUR), BUNDEL<br>majari (CHANDA), ghorayal (SEC<br>Habitat.—Common on the pla <sup>5118</sup> of Northern ^ dia on low-lying land.<br>Fodder.—See Vol. III., 423.<br>Wightii, Anders.                                                                                                                                                                                       |
| 489   1               | S Jn.—ANTHISTIRIA WIGHTII. « ». / A. BIADHII, Wight, A. PROSIRATA,                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| FODDER. <b>490</b>    | Vern. — Gandel (ALIGARH), NW. P.; Ganni (GUJRANWALA. SHAHPO.,<br>and LAHORE), PB.; Ghor-mason, muson, pulsu-malwa-gadi (CHAMDA),<br>musan (BALAGHAT), C. P.<br>Habitat. — Associated with the <b>DRCCOP</b><br>Fodder. — See Vol. 111., 423.                                                                                                                                                                                                                                                                                         |
|                       | ISINGLASS, GELATIN, GLUE, AND GELOSE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 491                   | and is thus separated from the<br>aporation of the water the gelatine<br>and is thus separated from the<br>aporation of the water the gelatine<br>names accordi<br>and is thus separated from the<br>aporation of the water the gelatine<br>nature of the substances from which it was extract-<br>fly indicated :                                                                                                                                                                                                                   |
| 471                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| fi                    | Icthyoto a rest of the poisson, Fr HAUSENBLASB, Germ.<br>The provided a fight of the poisson, Fr HAUSENBLASB, Germ.<br>The English<br>tame is a corruption from icing and glass or iceglass, and vulgarly the<br>mame isinglass is often applied to Mica.<br>As i by the Greek name forthis<br>by the Greek name forthis<br>reglass of Eur2 <sup>2</sup> ear Commerce is chiefly prepared<br>the Caspian Sea, the Black See with A as other Sturgeo/s. Wnd in<br>inglass (obtained from Bazil and Guiana, w prepared from one or two |
|                       | inglass (obtained from Black Sei, av A A tic Ocean, The Brazilian<br>becies of Silnrus, chieff Sazil and Guiana, « prepared from one or two<br>own a large numba rf fish' Parkerii. The A 30 f India is derived<br>and sharks, &c., T A 30 f India is derived<br>but only recent, whas India                                                                                                                                                                                                                                         |
|                       | and sharks. Ac. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| . Gelatine. (G. Watt.) IS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SINGLASS.  |
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| come to be viewed as a source of isinglass for Europe, the trade having been<br>previously with China in the edible substances known as FISH MAWS and<br>SHARKS' FINS. Many writers, however, affirm that all that is necessary to<br>expand an Indian trade in Isinglass is to instruct the fishermen to bestow<br>greater care in selection and preparation of the substance.<br>The uses of Isinglass are in the preparation of jellies and confections<br>and as a clarifying or filtering medium for wine, beer, coffee, and other<br>liquids. 'It is also employed along with gum as a dressing to give lustre<br>to ribbons and other silk articles.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ISINGLASS. |
| The reader is referred to the article under Sharks' Fins and also to that on Fish.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | •          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 492        |
| (5) Gelatine (or Gelatin) and (c) Glue.<br>TJiese substances are prepared from animal flesh, bones, skins, hoofs,<br>and horns. The former is a purer article than the latter, all the stages in its<br>manufacture being carried out with scrupulous care and cleanliness. Glue<br>may be defined as a glutine manufactured from the tan-yard.refuse.<br>But there is no chemical difference between gelatine, glue, and isinglass.<br>The purer forms of transparent gelatine are used for culinary purposes<br>(calves'-feet jelly, milk-white blance-mange, usually containing gelatine<br>instead of isinglass), but for certain purposes gelatine like glue is used as<br>an adhesive medium and hence glues of every quality passing into gela-<br>tine are met with in commerce.<br>The Edible Swallows' Nest may be described as an Indian edible gela-<br>tine (see Vol. II., pp. 505-509). In some parts of India a glue is said to<br>be prepared from fish bones, but ordinary glue is also made as, for exam pie,<br>in Lucknow. The article chiefly used is apparently, however, entirely im-<br>ported (see <i>Hoey, Trade and Manuf. N. Ind</i> %i 176).                                                                                                                                                                                                                                                                                                                                                                                                                                |            |
| (d) Gelose (a name given by Payen).<br>This is a gelatinous substance prepared from the various Algae designated in India as Agar-Agar, and in European commerce as CHINA MOSS.<br>The best known substances of this nature are the so-called Ceylon Moss (see Gracilaria) and the Japanese Isinglass. The last mentioned is derived from one or two species of sea weed (according to Mr. D. Hanbury), but more especially from Gelidium corneum.<br>Gelose differs from gelatine in not being precipitated by tannic acid : from the starch jellies in not being rendered blue by iodine, and from gum, by its insolubility in cold water, and its greater gelatinising power. In this last respect it forms ten times as much jelly as an equal weight of isinglass, and may, therefore, be economically substituted. It contains no nitrogen, and is therefore not nutritious; but as isinglass and gelatine are most frequently used in culinary purposes as vehicles for other nutritious materials, this need not be a serious objection to the employment of gelose. Gelose contains 42770 per cent, of carbon, 5775 hydrogen, and 51*455 oxygen. It, therefore, belongs to the class of proximate principles which possess a larger proportion of oxygen than is required to form water with the hydrogen. It swells up in cold water and dissolves almost wholly in boiling water and on cooling forms a jelly of 500 times the weight of water to the quantity of gelose employed. It differs, however, from jelly with isinglass in the important character that it requires a high tempera- |            |

with this substance do not dissolve in the mouth, and in consequence the jellies known as seaweed are exported from China without deteriora-tion. One of the chief forms of gelose appears to have been shown at the Paris Exhibition of 1878 under the name of Thao or Ta-o, If the hot solu-tion of that substance be stirred until cool, it forms a liquid instead of a jelly; and that preparation gives body and gloss to fabrics without stiffenings

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| ISCHCE          | MUM The Bhabar Grass.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>angustif</u> | plium                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| GELOSE.         | them—the defect of dextrine and starch. The properties of Ta-o in this respect are further heightened by combination with glycerine. It may be mixed also with talc, and even while hot it will intermix with gum, starch, dextrine, gelatine, or gum tragacanth, thus forming <i>size</i> or <i>dressing</i> that may be employed with great advantage to silk goods. Since this dressing is only again softened at high temperatures, the fabrics are not deprived of it by rain or when exposed to damp atmospheres. Gelose may also be employed in double-dyeing by being combined with sulphate of copper and the chlorides of aniline and potassium. For sizing paper it is of great value; indeed, its chief obstacle to an extended application in the arts is its high price. It is somewhat surprising that so valuable a substance should not have been made better known and more carefully examined. Watt, for example, remarks that since no definite compound has been formed with it, its atomic weight and rational rormula has not been determined. Its chief properties seem, however, to ally it with the gums (n. Morin) and according to M. Porumbaru the formula for pure gelose is $C_6H_{10}O_5$ thus analogous to lichenin, inulin, and tunisin. Dr. Dymock remarks of China Moss: "There is, however, no reason why a similar substance should not be made from our common native seaweeds, of which Gelideum corneum and Gracilaria confervoidea approach most nearly in character the Algae from which Thao is made." This statement would justify the recommendation made by Royle nearly half a century ago that the indigenous Algae and other sources of singlass on the seashores of India should be carefully examined with the view to discovering whether any of them might find a place in European commerce. At present the <i>Agar-agar</i> used in India is entirely imported. |
|                 | ISCHCEMUM, Linn.; Gen. PL, III., Vol. III.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 494             | <b>Ischcemum angustifolium,</b> Hack,; DC. Monogr. Pkan., Vol. VI.,<br>241 ; Did hie. Fodder Grasses of Northern India. 2J (under<br><b>Pollinia).</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                 | Syn.—ANDROPOGON BINATUS, Rets.; A. NOTOPOGON, Steud.; A. OBVAL-<br>LATUS, Steud.: A. INVOLUTUS, Steud.; SPODIOPOGON ANGUSTIFOLIUS,<br>Trin.; S. LANIGER,M?«. / S. NOTOPOGON, Nees.; POLLINIA ERIOPODA,<br>Nance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                 | Vem.—Bkdbar, HIND.; Baboi, babui, sab a, BENG.; Sabai (HIND.),<br>CHUTIA NAGPUR; Bachkron, SANTAL; Bankas. ban-hush, baib. bamoth,<br>NW. P. andOuDH; Pan-babiyo (ALMORA), KUMAON; Bhabar, babbar,<br>munjiy baggar, PB.; Nulka-gadi, som, tnoya, C. P.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                 | References.—Stewart, Pb. PI., 249; Hooker, Icones Plant. Pl.> t773f Royle,<br>III. Him. Bot., 415, 416; Report Royal Bot. Gard., Calcutta {in<br>part). 1877-78; 1882-83; Kew Bulletin, July 1888, pp. 157" <sup>0°</sup> »' Journ.<br>Linn. Soc. {in dart), Vol. XX., 409; Trans. Agri. HoH. Soc. ofIndia<br>(in part), VIII., 272; Jour. {Old Series), XII., 332; XIII., 2Q3 {New<br>Series), V., {Proc), 21; VIII 98-106.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                 | Habitat.—A perennial grass with strong wiry stems, clothed at their bases with woolly^ pubescence. The leaves are long and narrow and with involute edges. Each stem bears two to four racemes, composed of numerous spikelets which are densely clothed with brownish or golden coloured $I$ AQA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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I. 494

| Α      | ΤA  | 4'   | *     | 1 -      | AM i.  | • 1   | /PlT/in    | ISCHCEMUM                   |
|--------|-----|------|-------|----------|--------|-------|------------|-----------------------------|
| <br>An | Inc | dian | Paper | r-making | g Mate | rial. | (G. Watt.) | ang <sub>U</sub> stifoliunU |

silky hairs. This species is plentiful in the Sub-Himdlayan tract as well as in the hilly parts of Bundelkhand and Central India. It is frequently found associated with Eriophorum comosum (which see, *Volume III., 266)*, and hence from Waliich and Royle proceeded ap error, only recently corrected, of viewing both as one and the same. Eriophorum is a sedge and Ischsemum a grass, but both are no doubt employed for the same purposes.

Fibre.—[This grass is used in paper-making and in the construction of strings, ropes, and mats. It seems doubtful whether the natives of India separately distinguished it from the sedge above alluded to, and these two plants accordingly appear to bear the same vernacular names. The passages that would appear more especially to allude to the sedge allude to it as employed in the construction of rope-bridges, but as a source of paper there is probably no doubt that the bulk of the material so employed is the grass here dealt with. It is perhaps unnecessary to repeat the facts published in the Kew Bulletin (/. c.) showing what led to the confusion regarding these two plants, nor those which ultimately cleared the matter up. It would seem that had Dr. Stewart's remarks republished below (made in 1863) received more careful consideration, the ambiguity that for long existed would never have existed. The following passages regarding the grass as a source of paper, &c, are, however, of practical interest and may be said to convey all that is known on this subject:-

Mr. R. W. Bingham, writing of the Sasseram District of Bengal in 1862, remarked :—

"Buggaie is a wild grass which is ready for cutting in October and November. Several hundred thousand maunds are cut annually in the forest of the Kymore range, and it is sold for roofing and other purposes; when made into a coarse twine it answers for tying thatch and bamboos, as well as for bottoming the cots, or charpoys of the lower orders, as well as a more expensive article. Much of it finds its way to the river ports, but I fancy it is all consumed in this country, and would be but of little use in the manufactures of Europe" (Agri.-Hort. Soc. Journ., Vol. XII., p. 332).

Dr. J. L. Stewart wrote of this grass in Bijnor (September, 1863) as follows: —" This grass, which is abundant in this part of the Himalaya and occasional on the skirts of the Siwaliks, appears to furnish almost all the material called *bhabar* so largely used for string in these parts. Botanists, from Waliich and Royle downwards, have stated this to be the produce of Eriophorum comosum, of which, however, apparently a very small proportion of that brought to the plains consists. Dr. Brand is first drew my attention to the probability of the ordinary belief being erroneous, and subsequent enquiry has shown that the case is as above stated.

"The string is very coarse but strong, and although there is great waste in the manufacture, exceedingly cheap. It is well adapted for boat ropes, the rope-work of bedsteads, and other ordinary purposes. Possibly the *bhabar* may come into play as a paper-material, at least it is worth the trial, and probably larger quantities of the raw article could be got than of any other fibre that I know of in this part of the Himalaya." Dr. Stewart says, the price of the raw material is annas 8 per maund and of the string R2 per maund (*Agri.-Hort. Soc. Journ., Vol. XIII., 293*).

Dr. King, in his report of the Royal Botanic Gardens, Calcutta, for 1882-83, re-established the independence of the two forms of the *bhabar*.

"In several former reports I have referred to the leaves known by the vernacular name *bhabur* as the produce of Eriophorum comosum. I have now satisfied myself that the bulk of the *bhabur* used by natives for rope-making is not derived from Eriophorum, as I had supposed, but from Andropogon involutus. This grass, I find from enquiry locally made,

FIBRE. **495** 

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| ISCHCEN<br>angustifo       | The Rhober Cross                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <u>Angustifo</u><br>FIBRE. | <ul> <li>abounds in the hill parts of Behar and Chutia Nagpore, where it is known as Sabai. From these regions it can be obtained in quite considerable enough quantity to make its utilization as a paper material a feasible project, and the people who actually collect it, sell it at a reasonable enough rate. But in order to get it brought to Calcutta in sufficient quantity for local manufacture, or for shipment to Europe, middlemen have to be employed, whose ideas of profit are pitched so high that, until they become modified, the utilisation of bhabur must remain in abeyance. This is only in accord with the common experience in the mofussil, that competition in trade is not sufficiently keen to have much effect in keeping down prices, but that, on the contrary, traders still form guilds banded together to entrary, traders still form guilds banded together to entrary traders still form guilds banded together to entrary traders the price being too high ; besides the outturn is not so great as with jute. I found it not to yield more than about 35 per cent, of paper. This is to a great extent owing to the tops being more exposed to the atmosphere, as this part appears to get ripe much earlier than the bottom.</li> <li>The process of boiling the perished or top part gets destroyed before the bottom part of the stems gets sufficiently reduced to a pulp. This accounts for the great loss in the manufacture, but this could be obviated by having the top parts cut off before despatching it to the paper mills, fact reguing bhabur as a source of paper :— 'I believe it will make a fair sheet of paper, much the same as fine esparto, but does not suffact the same proces.'. The some suffact reguing bhabur as a source of paper is suffact reguing parts is in collection, carriage to port of shipment, and, igterly, bautons and erroyses. Freight to England, &amp;c. Whether from India, with long and probably costly inland carriage, with heavy freight added, it can cons as esparto is. Like esparto, in <i>situ</i> it is worth very littl</li></ul> |
|                            | I. 495                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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An Indian Paper-makiag Material. (G. Watt) ISCHGEMUM angustifolium.

it gives a *good* crop. The plot on which it is planted must be kept free from other grass. When it is seven or eight years old, the roots should be beaten down with wooden mallets, or a plough should be run through them in every direction, and fresh earth thrown over the whole; this will increase the yield. If not treated in this way, it will cease yielding any crop. When grown too old, it must be taken up entirely, re-divided in small bunches of roots, and transplanted to a fresh locality.

"(4). We bought the grass always in local *hats* for roofing purposes (as rope) befoVe we grew our own, and nowhere in OUT neighbourhood am I aware of its being cultivated in any but very small patches by a solitary man here or there. It is not cultivated as a source of income or trade, so that I am unable to say where the roots may be bought, or at what price. We got a small quantity of the roots originally from a Hindu village, but by fostering and spreading their cultivation we have now a considerable quantity. It should be planted in a dry spot where no water lodges, as experience has shown in one of our stations, where the water oozed up from below and rotted the roots, that it would not grow there. A sloping site is probably the best."

"When we first started the Mission here we had to pay R4 a maund in the *hdts* for the grass, in order to twist it into rope or string, and it was the having to pay so much that led me to try and cultivate it ourselves. The grass runs to seed in the hot months, shortly before the rainy season, but these must be cut off and removed, or the crop will deteriorate."

It is understood that the Bally Paper Mills, Calcutta, still continues to use a considerable amount of the grass, drawing its supplies from Chutia Nagpur and the Nepál Tarai. In the *Colonial and Indian Exhibition Catalogue* the writer stated regarding this paper material :—

" In a country teeming with fibres, it is a surprising fact that the question of a paper-fibre should still be under consideration. European authors seem always to forget, however, the immense size of the continent of India, and that a few hundred miles are of little consideration in most Indian questions; but, when this assumes the form of railway freight upon a bulky article, it becomes prohibitive even to industries that can afford to pay more than paper-making. To cultivate fibre, especially for paper, has many drawbacks, and one only need be mentioned-the cost of land near commercial centres is so high as to almost preclude the idea of the cultivation of paperfibres. But the paper fibre must, like esparto, be fit almost for immediate immersion in the vats, for paper-making can never pay for cultivation and separation of fibre, even where land can be got at a merely nominal rent. No fibre known to commerce can compete with jute in point of cheapness, yet the paper-maker can afford to purchase jute waste and jute cuttings only, so that but for the demand to meet an altogether different purpose, the paper-maker could never procure jute. The two most important indigenous paper grass-fibres in India are munj grass and *bhabar* grass. These are now being used by our Indian paper mills; the supply at a remunerative price is the chief obstacle to an extend-ed employment. The roots and lower stems of rice have been suggested as a paper material, and if it be shown that these are worth the trouble of collecting, the supply might be practically unlimited; but it is doubtful whether the paper-maker could pay sufficient to cover freight and expense of collection. It has been demonstrated that bamboo affords excellent paper, but practical difficulties exist which have, for the present at least, dispelled the hopes once entertained of the immense tracts of bamboo forest becoming of commercial value as supplies of paper material.

The most valuable pr.per materials in India are, after all, old rags, waste gunny bags, and old *sunn* ropes."

FIBRE.

| ISCHCEMUI<br>ciliare. | M Fodder Grasses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| FIBRE.                | The results of the Exhibition abundantly justified the above opinions<br>and the gentlemen who were present at the conference on INDIAN PAPUI<br>MATERIALS agreed that "while the <i>bhabar</i> and <i>muni</i> grasses were ver-<br>good for paper, it would never pay to import them into fiurope in that condi-<br>tion, the more so since esparto was obtainable at a price far below what would<br>be charged in freight alone from India. Unless these grasses scold pro-<br>fitably be shipped in the form of half stuff they were out of the question."<br>Thus, so far as a foreign trade in these grasses is concerned, it would seen<br>that no hope need be entertained as against esparto, and it is probable<br>that next to the want of a uniform and large supply, the question of railway<br>freight within India itself is likely to operate unfavourably against the<br>development of a large Indian paper trade in <i>bhabar</i> grass. The Agduc<br>tion, prices, and uses of <i>bhabar</i> grass, and at the instance of the '^mmiPif<br>of Commerce issued to its members in 1886-87 a series of questions. //?<br>maunds might be obtained in a season from the Kharrackpore hills at<br>about Ri-14 a maund. Dr. Hill, Parulia, stated that it was cultivated if<br>some parts jpf Manbhoom, but to a larger extent in Singhbhoom (Chutta<br>Nagpur). The people miake 'strings and ropes' of it which are exported<br><b>RI per maund. Mr. T. M. Gibbon, O.I.E.,</b> replied that "the <i>abov</i><br>grass is grown largely in the northern portion of the district, but I believe<br>only in the north, in the jungle lands of Ramnuggur and Rajeporp<br>Solureah. It is also grown in the Nepal Tarai from Apri-<br>"Egreve the exports of the grass was sent direct to the Bally Mills at, 1<br>believe, R2-8 per maund.'' Syed Ali, Nawab, of Jainugger, D <sup>athot, mag<br/>grows on the first range of hills in Nepal: that growing at the bottom<br/>Peppe of Gorakhpore reported that " This grass is called here <i>bunkas</i>, ang<br/>grows on the first range of hills in Nepal: that growing at the bottom<br/>Banjaras and others at Bahadurgunj, about 3 miles south of the hills and<br/>about 25 miles north-</sup> |
| Fodder.<br><b>496</b> | Prod.]<br>Fodder.—See Vol. III., 423.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 497 Is                | schcemum ciliare, <i>Ret*.</i> / <i>Duthie</i> , <i>Fodder Grasses of N. India</i> , 3°'<br>Syn.—I. ARISTATUM, <i>Willd.</i><br>Vern.—Bara-toriya-gadi, pyana-koru-gadi, paba, irkor, guhera, CENIRAI<br>FROVS,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| I                     | <b>Reference.</b> —Hackel in DC. Monogr. Phan., Vol. VI., p. 225.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Fodder Grasses. (G. Watt.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SCHCEMUM        |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <u>rugosum.</u> |
| Habitat.—Abundant over the greater part of India, from the Himálaya<br>to Ceylon, growing in wet marshy ground.<br>This species is divided by Hackel into the following varieties and sub-<br>varieties.                                                                                                                                                                                                                                                                                                                                                |                 |
| Var. a—genuium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |
| Sub-var. 1.—PROREPENS. Syn.—I. TENELLUM, Roxb., FL Ind., Ed.,<br>C.B.C., 108. Nepál to South India.<br>Sub-var. 2.—SCROBICULATUM. Syn.—I. SCROBICULATUM, W. & A.                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| Ceylon.<br>Sub-var. 3.—MALACOPHYLLUM. Syn.—SPODIOPOGON OBLIQUCEVAL-<br>VIS, Nees; ANDROPOGON MALACOPHYLLUS, Hochst.; I. ARISTATUM,<br><i>Roxb., FL Ind., Ed. C.B.C., 107.</i> Terai to South India, and in Burma.<br>Sub-var. 4.—VILLOSUM. Syn.—SPODIOPOGON VILLOSUS, Nees; S.                                                                                                                                                                                                                                                                          |                 |
| <b>^</b> Fodder.—Occasionally used for feeding cattle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 498             |
| <ul> <li>Ischcemum laxum, R. Br.; Duthie, Fodder Grasses of N. India, 31.</li> <li>Syn.—ANDROPOGON STRIATUS, Klein; A. NERVOSUS, Rottl.; A. BROWNEI, Kunth.; A. MACROSTACHYUS, Anders.; POLLINIA STRIATA, Spreng.; HOLOGAMIUM NERVOSUM, Nees; ISCHIEMUM NERVOSUM, Thw.; I. MACROSTACHYUM, A. Rich.; SEHIMA MACROSTACHYUM, Hochst.</li> <li>Vern.—S air an, hirn, RAJ.; Sein, seind, sarun, C. INDIA; Sira, sedwa, pona, C. P.; Sainad, BERAR.</li> <li>References.—Hackel, in DC. Monogr. Phan., Vol. VI., 243; Indian Exception VII.</li> </ul>        |                 |
| Forester, XII., App. 24.<br>Habitat.—Hilly parts of Rajputana, Bundelkhand, and the Central<br>Provinces. It forms a large portion of the undergrowth in the Nimar<br>forests, and seedling trees find beneficial shelter in the spaces between the<br>clumps.                                                                                                                                                                                                                                                                                          |                 |
| Fodder.—It is considered as one of the best of the Central India fodder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
| grasses.<br>I. pilOSUm, Hack.; Duthie, Fodder Grasses of N. India, 31.<br>Syn.—ANDROPOGON PILOSUS, Klein; SPODIOPOGON PILOSUS, Nees,<br>Vern.—Khuri, CENTRAL INDIA'• Khun da, kunda, C P.; Nattu, TEL.<br>References.— Wight, in Mad. Journ. Lit. & Sc, II., 139; Elliot, FL Andhr,<br>i30; Hackel, in DC. Monogr. Phan., Vol. VI., 240.                                                                                                                                                                                                                |                 |
| Habitat.—A tall, rather coarse, glaucous grass, with thick deeply pene-<br>trating roots. The long spikes, usually in pairs, are densely clothed with<br>white silky hairs. A characteristic black soil species and very common in<br>the Central Provinces. Elliot mentions that " it infests the <i>r egad a</i> , or black<br>cotton soil, to the great detriment of cultivation. It is called <i>Kunduru</i><br><i>nattu</i> , or the 'grievous weed,' to distinguish it from <i>Garaka nattu</i> or • grass,<br>weed ' which is Cumedon Destulor " |                 |
| weed,' which is Cynodon Dactylon.''<br>Fodder.—Considered to be a good fodder grass in the Nimar district.<br>Captain Masters, writing from Guna, reports this grass as being of in-                                                                                                                                                                                                                                                                                                                                                                    |                 |
| different quality.<br>I. rugOSUm, Salisb.; Duthie, Fodder Grasses of N. India.<br>Syn.—ANDROPOGON RUGOSUS, Stend.<br>Vern.—Mehat, munmuna, PB.; Jalgundya, toli, RAJ.; Dhanua maror, N.                                                                                                                                                                                                                                                                                                                                                                 |                 |
| <ul> <li>W. P. &amp; OUDH; Amarkarh, maggru-gadi, viurdi, C. P.; Tudi, BERAR<br/>Marudi, SANTAL.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 101; Indian Forester, XII.,<br/>App. 25; Rev. A. Campbell, Report Chutia Nagpur; Hackel, in DC-<br/>Manager Phan. Vol. VI, 206</li> </ul>                                                                                                                                                                                                                                                            | ,               |
| Monogr. Phan., Vol. VI., 206.<br>Habitat.—A common grass of wet marsh} ground in the plains, and at<br>low elevations on the Himálaya. <b>Roxburgh</b> observes that it is generally                                                                                                                                                                                                                                                                                                                                                                    | 7               |

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| IXORA<br>acumina | Itea: Iv ry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                  | found growing amongst rice, and is so much like it that until the <b>plan</b> have come into flower they are with difficulty distinguished from it. <b>T</b> outer glumes of the florets are hard and transversely wrinkled, hence the specific name.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| FOOD & FODDER.   | <b>Food and Fodder.</b> —Cattle and horses eat this grass when it is youn<br>In some parts of the Central Provinces the grain is used as food.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 504<br>505       | Ischoemum SUlcatum, Hack, in DC, Monogr. Phan., Vol. VI., W<br>Vern.—Pownia, C. INDIA; Pona, C. P.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                  | <b>Habitat.</b> —Abundant along the edges of cultivated land in the black<br>soil of Central India. Allied to I. laxum, but more slender, and with the<br>culms branching. The leaf blades are rough with minute prickles directed<br>upwards.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| FODDER.<br>506   | <b>Fodder.</b> —A very nutritious grass, and largely used as fodder cvhereve it occurs in abundance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 507              | <b>ISONANDRA</b> , <i>Wight</i> ; <i>Gen. PL, II., 637.</i><br>The species of this genus, as it has now been restricted, are of little or r<br>economic value. They are trees which doubtless yield timbers of some us<br>but the plants of interest formerly referred to this place have been tran<br>ferred <b>to Dichopsis</b> <i>{which see, Vol. III., pp. 101-iog}</i> .                                                                                                                                                                                                                                                                                                                 |
|                  | ITEA, <i>Linn.; Gen. PL, I.</i> , 647.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                  | A genus of shrubs or small trees comprising some five species, of which three occur on the Himålaya and Khásia mountains.<br>The timber, though small, is considered useful by the hill tribes, and in Chamba the bark is employed medicinally.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 508              | Itea chinensis, <i>Hook. &amp; Am.; FL Br. Ind., II, 408;</i> SAXIFRAGACEN Habitat.—A small tree of the Khasia hills between 4,000 and 6,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 509              | I. macrophylla, Wall.; II. Br. Ind., II., 408.<br>Vern.— <i>Teturldum</i> , LEPCHA.<br>Habitat.—A small tree in the Eastern Himalaya from Sikkim and<br>Bhutan to the Khasia hills; altitude 2,000 to 4,000"feet. Found by m                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 510              | author in Manipur at altitudes of 4,000 feet.<br>I. nutans, <i>Royle</i> ; <i>III.</i> , 226; <i>FL Br. Ind.</i> , <i>IL</i> , 408.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                  | Vern.—Lelar, KAGHAN; Garkath, KUMAON.<br>Habitat.—A small tree found on the North-West Himalaya from tr<br>Indus to Nepal. Stewart specially mentions it in his account of Hazar<br>and Kaghan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                  | IVORY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                  | For an account of this substance see under <b>Elephas indicus</b> , Vol. In 226.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                  | <b>IXORA</b> , <i>Linn.; Gen. PL, II, 113*</i><br>The various species of <b>Ixora</b> , though extensively cultivated in the gardens<br>of the hotter parts of India, are not, as a rule, of much economic value. For an<br>account of the cultivated species and varieties the reader is referred to <b>r</b> ir-<br><b>minger</b> , <i>Man. Gardening for India, pp. 580 to 585.</i> Several species such as<br>I. nigricans and I. spectabilis, are large bushes or small trees which yield<br>timbers of some value. Of the latter, <b>Kurz</b> remarks that it is yellowish-white,<br>heavy, close-grained, hard, and brittle; on exposure turning pale-coloured ana<br>blockish streaked |
| 511              | blackish-streaked.<br><b>Ixora acuminata,</b> Roxb.; FL Br. Ind., III. > 137; RUBIACE*.<br>Vern.— Churipat, NEPAL; Thekera, ASSAM.<br>Reference.—Roxb., FL Ind., Ed. C.B.C., 128.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| The Flame Tree.       (G. Watt.)       Thervillora.         Parvillora.       Parvillora.         Habitat.—A robust, glabrous shrub distributed from Sikkin 3,000 fet       Dec.         Bután, Assam, Khásia hills, and Chittagong.       Dyc.—In a note on the Dyce of Assam, the Director of Land Records and Agriculture mentions this plant as used as a,mordant along with Arnotto (Bixa Orellana).       DVE.         Itera.—Rangan, Fil. Br. Ind., III., 143.       The FLAME TREE OF THE WOODS.       Sym.—-KORA (RANDIFLORA, Rock.): PAVETA COCCINEA, P. IN-CARNATA, Inc.: I. BRADHUCA, Rock.; PAVETA COCCINEA, P. IN-CARNATA, Home: P. BANDHUCA, Rock.; PAVETA COCCINEA, P. IN-CARNATA, Buner, P. I. BANDHUCA, Rock.; PAVETA COCCINEA, P. IN-CARNATA, Mark, F. Burn, H. J. & G. Rept. Pegu, App. c.: I. Beddmik, ark, Hadhark, ark, Hadhark, Ark, St. Beddmek, Rom, Bandhuka, Timb, 23c, Dalz. & Gibs, Bomb, FL, 112; Sir William Lonez, V., William Jonez, V., William Jonez, V., William, Jone, M., William, Jone, J., William, Jone, M., William, Jone, J                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                       | IXORA |
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| <ul> <li>Habitat.—A robust, glabrous shrub distributed from Sikkim 3,000 feet to Bhután, Assam, Khásia hills, and Chittagong.</li> <li>Dye.—In a note on the Dyes of Assam, the Director of Land Records and Agriculture mentions this plant as used as a,mordant along with Arnotto (Bixa Orellana).</li> <li>Ixora COCCinca, Linn.; Fl. Br. Ind., III., 143.</li> <li>The FLAME TREE OF THE WOODS.</li> <li>Sym.—IXORA ARADDELORA. BC: 1. PROPINGUA, BC: 1. INCARNATA. DC: 1. OROVATA. Heyne; 1. BANDHUCA, Roxb.; PAVETA COCCINEA, P. INCARNAT, Heyne; 1. BANDHUCA, Roxb.; PAVETA COCCINEA, P. INCARNAT, BING: P. Pankul, MAR.; Pdn-sd-yeik, BURM.; Bandhuka, rakkaka, landhajiwaka, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 126, Brands, For. FL, 275; 'Kurz, For. FC, Burn, IL, 26; Rept. Pagu, App. cxi; Beddame, Man. cxxxiv.7; Gamble, Man. Timb, 230; Datz. &amp; Gibs, Bomb, FL, 112; Sir William Jones, Y., 80; Mason, Burma and Its Poolfe, 415; 766; Dymock, Mat. Med. W. Ind., 2nd Ed., 410; Lisboa, U. Pl. Bomb, Z44; Baldour, Cyclop, IL, 3g; Gazteters:-Orisa, IL, 178; Mysore &amp; Corry, L, 70; Kanara, 71; Banda, 81; Journ. Agri-Hort. Soc. Ind. (Old Scries), H., 365; X., 11; (New Series), IV, 118.</li> <li>Habitat.—A small shrub extensively cultivated in gardens throughout the hotter and sugarandy and administered twice a day (Dymock).</li> <li>MEDICINE.</li> <li>Methody and Minist introduced the remedy. The mode of preparing the drug is given as follows:—The root is ground to a pulp with a lifte water on a stone with a small proportion of long pepper, and about 30 to 40 grains of the fresh root should be taken in this way every three or four fours. A thicture made with 40.2 of the dried root to one pulp with a lifte water on a stone with a small proportion of long pepper, and about 30 to 40 grains of the fresh root and Receives and with some and the Howrat and the Howrath.</li> <li>Sacred.—The Howers are held sacred to Siva and Vishnu.</li> <li>Jarvfiffora, Vahl., -Fl. Br. Ind., HL, 142.</li></ul>                                                                                                            | The Flame Tree. {G.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <i>Watt.</i> ) n                                                                                                                                                                                                                                                                                                                                                                                      |       |
| <ul> <li>Ixora COCCinea, Linn.; Fl. Br. Ind., III., 143.</li> <li>The FLANE TREE OF THE WOODS.</li> <li>SynIXORA GRADIE(ORA. Br.: L PROFINOUA. Br.: L INCARNATA. DC: LOBOVATA. Heyne: I. BANDHUCA. Roxb.; PAVETTA COCCINEA. P. INCARNATA. Blune: P. BANDHUCA. Roxb.; PAVETTA COCCINEA. P. INCARNATA, Blune: P. BANDHUCA. Roxb.; PAVETTA COCCINEA. P. INCARNATA, Blune: P. BANDHUCA. Roxb.; PAVETA COCCINEA. P. INCARNATA, PR. BANDHUCA. Roxb.; PAVETA COCCINEA. P. INCARNATA, PR. BANDHUCA. Roxb.; PAVETA COCCINEA. P. INCARNATA, PR. BANDHUCA. ROXD.; PANDAL, MEDICINE. STECTAL OFLOW. J. St.; Gazetteers:—Orisa, II., 173; Mysore &amp; Coorg. J. 70; KANATA, T.; BRIAGA, 8]; JUNICA, STECTAL OFLNIONS.—5 "The root of the flowers, fried in ght, are rubbed down with 4 gunjad each of "curmin and ndgRessar, and made into a bolus with butter and sugarcandy and administered twice a day "(Dymock).</li> <li>SPECIAL OFINIONS.—5 "The root of the plant is used in the treatment of the Gaute dysentery by Assistant Surgeon U. Lai Deb attached to the Howrarh General Hospital who first introduced the remedy. The mode of preparing the drug is given as followis:—The root on enpint of proof spirit has been also found efficacious though less so than the fresh root. The remedy has been largely used in the form of tiscure in the Howrand General Hospital in both the Europea</li></ul>                                                              | to Bhután, Assam, Khásia hills, and Chittagong.<br>Dye.—In a note on the Dyes of Assam, the Director of Land<br>and Agriculture mentions this plant as used as a <sub>#</sub> mordant al                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3,000 feet<br>1 Records                                                                                                                                                                                                                                                                                                                                                                               | DYE.  |
| <ul> <li>The FLAME TREE OF THE WOODS.</li> <li>SynLIXORA GRANDPILORA, Br.: I. INCARNATA, DC:<br/>I. OBOVATA, Heyne: I. BANDHUCA, Roxb.; PAVETTA COCCINEA, P. IN:<br/>CARNATA, Blume: P. BANDHUCA, Roxb.; PAVETTA COCCINEA, P. IN:<br/>CARNATA, Blume: P. BANDHUCA, Roxb.; PAVETTA COCCINEA, P. IN:<br/>CARNATA, Blume: P. BANDHUCA, Mig.</li> <li>WernKangan, raj ana, BENG, ; Pankul, MAR.; Pdn-sd-yeik, BURM.;<br/>Bandhufka, rakuka, landhäjivaka, SANS.</li> <li>ReferencesRoxb., Fl. Ind., Ed. C. B.C., 126; Brandfs, For. FL, 275;<br/>Kurz, For. F(, Burm, III, 26; Rept. Pegu, App. cxi, Beddome, Man.<br/>cxxiv, 7; Gomble, Man. Timb., 230; Datz. &amp; Gibss, Bomb, Z41;<br/>Sir William Jones, V. 80; Mason, Burma and Its People, 415, 786;<br/>Dymock, Mat. Med. W. Ind., 2nd Ed., 410; Lisboa, U. Pl. Bomb, Z44;<br/>Baljour, Cyclop.111, 3gi; Gazetteers:Orissa, II., 178; Mysore &amp; Coorg,<br/>I., 70; Kanara, 71; Banda, 81; Journ. Agri-Hort. Soc. Ind. (Did<br/>Series), II., 3s6; X., 11; (New Series), IV., 118.</li> <li>HabitatA small shrub extensively cultivated in gardens throughout<br/>the hotter parts of India. According to Roxburgh it is a native of China<br/>and the Moluccas, but Kurz regards it as a native of Lower Burma also.<br/>Medicine'' In dysentery 2 tolks of the flowers, fried in ghi, are rubbed<br/>down with 4 gunjad each of 'cummin and ndgkessar, and made into a bolus<br/>with butter and sugarcandy and administered twice a day ''(Dymock).</li> <li>SPECIAL OPINIONSB, '' The root of the plant is used in the treatment of<br/>acute dysentery by Assistant Surgeon U. Lai Deb attached to the How-<br/>rah General Hospital who first introduced the remedy. The mode of pre-<br/>paring the drug is given as follows:The root is ground to a pulp with a little<br/>water on a stone with a small proportion of long pepper, and about 30 to<br/>40 grains of the fresh root should be taken in this way every three or four<br/>hours. A fincture made with 40-c. of the dried root to one pint of prof spirit<br/>has been also found efficacious though less so than the fresh root. The<br/>remedy has been largely</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                       | 512   |
| <ul> <li>Syn.—INORA GRANDIFLORA. Br.: 1. PROPINULA. Br.: 1. INCARNATA. DC. 1. OBOVATA. Heyne: 1. BANDHUCA. Miq.</li> <li>Vern.—Rangan, raj ana, BENG.; Pankal, MAR.; Pdn-sd-yeik, BURM.; Bandhuka, rakukak, landhujivaka, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 126; Brandls, For. FL, 275; Kurz, For. F(, Burn, IL, 26; Rept. Pegu, App. cxi.; Beddome, Man. cxxxiv, 7; Gamble, Man. Timb, 230; Dalz. &amp; Gibs., Bomb, FL, 112; Sir William Jones, V. 80; Mason, Burma and IIS People, 415; 736; Dymock, Mat. Med. W. Ind., 2nd Ed., 410; Lisboa, U. Pl. Bomb, Z44; Balfour, Cyclop, II. 3gi Gazetters:—Orissa, IL, 178; Mysore &amp; Cong, I., 70; Kanara, 71; Banda, 81; Journ. Agri-Hort. Soc. Ind. (Old Series), IL, 365; X, 111; (New Series), IV, 118.</li> <li>Habitat.—A small shrub extensively cultivated in gardens throughout the hotter parts of India. According to Roxburgh it is a native of China and the Moluccas, but Kurz regards it as a native of Lower Burma also. Medicine.—" In dysentery 2 tolks of the flowers, fried in gli, are rubbed down with 4 gunjać sech of "cummin and ndgkessar, and made into a bolus with butter and sugarcandy and administered twice a day "(Dymock). SPECIAL OPINIONS.—§ "The root of the plant is used in the treatment of acute dysentery by Assistant Surgeon U. Lai Deb attached to the Howrah General Hospital who first introduced the remedy. The mode of preparing the drug is given as follows:—The root is ground to a pulp with a little water on a stone with a small proportion of long pepper, and about 30 to 40 grains of the fresh root should be taken in this way every three or four hours. A tincture made with 40 z, of the dried root to one pint of proof spirit has been largely used in the form of tincture in the Howrah General Hospital in both the European and Native Departments. It is a valuable remedy, but not as certain and effective as Ipecacunaha. The remedy is not disagreeable to the taste, nor emetic or poisonous" [Civil Surgeon J. G. Pikher, Howrah).</li> <li>Sher, Yora, KaBOR</li></ul>                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                       | 515   |
| <ul> <li>I. parviflora, Vahl.,- Fl. Br. Ind., III., 142.</li> <li>515</li> <li>THE TORCH TREE.</li> <li>Syn.—IXORA ARBOREA, Roxb. MSS. ex Smith; I. DECIPIENS, DC; I. PAVETTA, Andr.</li> <li>Vern.—Kota gandhal {loha jangia, in Chutia Nagpur), HIND.; Rangan, BENG.; Pété, KOL.; Merom met', SANTAL; Tellu, kurwan, URIYA; Disti, kori, GOND.; Kurat9 lokandi, narkurat, raikura, BOMB.; Kt'trat, lokandi, khura, MAR.; Kura, KONKAN; Shulundu kora, TAM.; Korimi pdla, korivipdla, putta pdla (Elliot), karipal, kachipadél, tadda pallu (Gamble), TEL.; Gorivi, (COORG), korgi, hennugorvi, KAN.; Pán sd yeip (Ixora generically), BURM.; Maha-ratambald (Karankuttai, punki rai,TAM. in Ceylon), SING. NOTE.—The Telejaru, Kanarese, and other South Indian names denote the use of the green twigs as t&gt;ches.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 128; Brandis, For.FL, 27S; Kurs, For. Fl. Burm., II, 21; Pegu Report, Ixxiii. ; Beddome, Fl. Sylv., t. 222; Gamble, Man. Timb., 230; Dalz. &amp; Gibs., Bomb. FL, U3: Elliot, Fl. Andhr., 93, 98, 112, 161; Rev. A. Campbell, Rept. Chuia Nagpur,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul> <li>Syn.—IXORA GRANDIFLORA, Br.; I. PROPINQUA, Br.; I. INCAR<br/>I. OBOVATA, Heyne; I. BANDHUCA, Roxb.; PAVETTA COCCIN<br/>CARNATA, Blume; P. BANDHUCA, Miq.</li> <li>Vern.—Rangan, raj ana, BENG. ; Pankil, MAR.; Pdn-sd-yeik<br/>Bandhuka, raktaka, landhàjivaka, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 126; Brandtš, For<br/>Kurz, For. F(. Burm, II., 26; Rept. Pegu, App. cxi.; Bedd<br/>cxxxiv.,7; Gamble, Man. Timb., 230; Dalz. &amp; Gibs, Boml<br/>Sir William Jones, V., 80; Mason, Burma and Its People,<br/>Dymock, Mat. Med. W. Ind., 2nd Ed., 410; Lisboa, U. PI. B<br/>Balfour, Cyclop.,11., 3gi; Gazetteers:—Orissa, II., 178; Mysoo<br/>I., 70; Kanara, 71; Banda, 81; Journ. AgriHort. Soc.<br/>Series), II., 3s6; X., 11; (New Series), IV., 118.</li> <li>Habitat.—A small shrub extensively cultivated in gardens the<br/>holuccas, but Kurz regards it as a native of Lower Bur<br/>Medicine.—'' In dysentery 2 tolås of the flowers, fried in ghi, a<br/>down with 4 gunjas each of 'cummin and ndgkessar, and made in<br/>with butter and sugarcandy and administered twice a day '' (Dyr<br/>SPECIAL OPINIONS.—§ "The root of the plant is used in the tra<br/>acute dysentery by Assistant Surgeon U. Lai Deb attached to<br/>rah General Hospital who first introduced the remedy. The mo<br/>paring the drug is given as follows:—The root is ground to a pulp v<br/>water on a stone with a small proportion of long pepper, and a<br/>40 grains of the fresh root should be taken in this way every thr<br/>hours. A tincture made with 4 oz. of the dried root to one pint of p<br/>has been also found efficacious though less so than the fresh r<br/>remedy has been largely used in the form of tincture in the Howra<br/>Hospital in both the European and Native Departments. It is<br/>remedy, but not as certain and effective as Ipecacuanha. The<br/>not disagreeable to the taste, nor emetic or poisonous'' [Civi<br/>J. G. Pilcher, Howrah).</li> </ul> | REA, P. IN-<br>K, BURM. ;<br>r. FL, 275;<br>dome, Man.<br>b. Fl. <sub>3</sub> 112;<br>re & Coorg,<br>Ind. {Old<br>hroughout<br>re & Coorg,<br>Ind. {Old<br>hroughout<br>re of China<br>ma also.<br>are rubbed<br>nto a bolus<br>mock).<br>eatment of<br>the How-<br>bode of pre-<br>with a little<br>about 30 to<br>ree or four<br>proof spirit<br>root. The<br>ah General<br>a valuable<br>remedy is | 514   |
| <ul> <li>THE TORCH TREE.</li> <li>Syn.—IXORA ARBOREA, Roxb. MSS. ex Smith; I. DECIPIENS, DC; I. PAVETTA, Andr.</li> <li>Vern.—Kota gandhal {loha jangia, in Chutia Nagpur), HIND.; Rangan, BENG.; Pété, KOL.; Merom met', SANTAL; Tellu, kurwan, URIYA; Disti, kori, GOND.; Kuraty lokandi, narkurat, raikura, BOMB.; Kt'trat, lokandi, khura, MAR.; Kura, KONKAN; Shulundu kora, TAM.; Korimi pdla, korivipdla, putta pdla (Elliot), karipal, kachipadél, tadda pallu (Gamble), TEL.; Gorivi, (COORG), korgi, hennugorvi, KAN.; Pán sd yeip (Ixora generically), BURM.; Maha-ratambald (Karankuttai, punki rai, TAM. in Ceylon), SING. NOTE.—The Telejaru, Kanarese, and other South Indian names denote the use of the green twigs as t &gt;rches.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 128; Brandis, For.FL, 27S; Kurs, For. Fl. Burm., II., 21; Pegu Report, Ixxiii.; Beddome, Fl. Sylv., t. 222; Gamble, Man. Timb., 230; Dalz. &amp; Gibs., Bomb. FL, U3: Elliot, Fl. Andhr., 93, 98, 112, 161; Rev. A. Campbell, Rept. Chutia Nagpur,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                       | 515   |
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| IXORA<br>parviflora.                                                                     | The Torch Tree.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| MEDICINE.<br>Root.<br>516<br>Fruit.<br>5?<br>FOOD&<br>FODDER.<br>518<br>DOMESTIC.<br>519 | No. 8411; Mason, Burma and Its People, 786; Trim., Cat. Ceylon VU 44 <sup>A</sup><br>Lisboa, U. PI. Bomb., 88, 344; Indian Forester, III., 203; "A"teers,<br>Mysore and Coorg, I., s<>, 70; Thana, 25; Kanara, 7' 7 Settle. *>***<br>Chanda, C. P., App. VI.<br>Habitat.—An evergreen shrub or small tree of Western Bengal, ""Y<br>Burma, Western, Central, and South India: from the Satpura range SOUH<br>wards. Distributed through Chittagong, and Pegu to Ceylon.<br>Medicine.—Rev. A. Campbell states that the Santals employ the ROOT<br>or FRUIT as a medicine to be given to females when the urine is high<br>coloured.<br>Food and Fodder.—The Santalseat the ripe FRUIT. In the<br>Provinces buffaloes are said to eat the leaves.<br>Structure of the Wood.—Light brown, smooth, very hard, close-g ark;<br>Well suited for turning and might do for engraving. Beddome 'tent."<br>that it is used for furniture and building purposes. Kurz says. *** ta<br>coff per cubic foot.<br>Domestic—The branches are employed for torches and are use<br>that purpose, by letter carriers (Brandts). |
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| Jade and Jadeite. (y. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | JADE.                    |
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| <ul> <li>JACK-FRUIT.</li> <li>Jack-fruit, see Artocarpus integrifolia, Linn.,- Vol. I., 330.</li> <li>JADE.</li> <li>Jade, Ball, in Man. GeoU of India, III., 5/6.</li> <li>Under the name Jade several different minerals are included, which are not always easily ditsinguishable. Scientifically, however, the name is restricted to a definite substance called NEPHRITE. This term, derived from ve<f>pos, the kidney, refers to the reputed value of the mineral in renal diseases, whence also it was formerly known as Lapis nephriticus by the Romans. The word Jade is probably a corruption of the Spanish "hijada," from the old name "piedra de hijada " applied by the Spaniards in Mexico and Peru to the mineral.</f></li> <li>True jade or Nephrite is a native silicate of calcium and magnesium, and may be regarded as a crypto-crystalline variety of horneblende. It has a specific gravity of from 2'91 to 3*06. Most specimens can be scratched by flint or quartz, but the mineral is said to become harder after exposure of its broken surfaces. It is compact, non-crystalline, and extremely tough, and varies in colour, from every shade of green to yellowish grey or white.</li> <li>JADEITE is one of the substances most commonly confused with true jade, from which it differs in its more complicated structure, containing as it does a number of bases combined with silica. Much of the Chineses so-called jade is in reality Jadeite. This substance was employed for making axes, and for ornamental purposes, by the inhabitants of the ancient Swiss Lake-dwellings, by the Egyptians, and by the Mexicans, &amp;c. A considerable proportion of the Chinese " Jade *' also consists of another mineral, Prehnite (a silicate of lime and alumina). Amongst other substances passed off as Jade are serpentine, and Cever imitations in glass, which may be seen even in the bazars of Burma and Central Asia.</li> <li>Vein.—Yashnt, HIND.; Sang-iyaskab, changtaw, sang-i-kas, P.B.; Yashm, sang-i-yaskm, PERS.J Suttashi, kashtaski, TURKI.</li> <li>References.—Mallet, Geol. of In</li></ul> |                          |
| SOURCES.<br>Begnal.—The horneblende rock west of Dumrahur and Urjhut, in<br>South Mirzapur, passes into a finely granular to nearly compact tremolite<br>forming a coarse Jade. In this state it is met with, more especially between<br>Kotamowa and bhamni, and at the top of Kurea Ghát. An olive-green<br>Jade occurs north-west of Kisari, and the mineral is also found associ-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SOURCES.<br>Bengal.<br>3 |
| ated with the Corundum at Pipra ( <i>Ball; Mallet</i> ).<br><i>Turkistnn.</i> —For many centuries Jade mines have been worked by the<br>Chinese at Karakash on the Kuenlun range. These mines were visited<br>and described by Dr. Stoliczka in 1874, from whose account it appears<br>that the rocks in which the Jade-bearing veins occur are syenitic gneisses<br>with micaceous and horneblendic schists. The mineral varies from pale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4                        |

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| JADE.       Jade and Jadeite.         SOURCES.       green to a dark green, but some of a white colour also occurs. Certain of the veins observed by Dr. Stoliczka were iofeet thick. Associated with the Jade in these veins a coarsely crystalline white dolomite was formal Besides these mines at Karakásh, jade is found in most of the strength of 2,000 years ago (Ball; Mallett).         Upper <i>Upper Burma.—The</i> Mogaung District has long been known to f. 2,000 years ago (Ball; Mallett).         Sourma. <i>Upper Burma.—The</i> Mogaung so-called jade which he has a main opportunity of examining, have proved by their specific gravity.         States that all the specimens of Mogaung so-called jade which he has a main opportunity of examining, have proved by their specific gravity.         It, texture, hardness, and colour to be Jadeite, a mineral which the mines were first described by Dr. Anderson in his Report on the Expail, to Yunan 1871, but since the British occupation, they have attracted my attention, and have formed the subject of an exhaustive and interest P report by W. Warry, Esq., Political Officer, Bhamo. From this it a p P that the discovery of the mineral was accidentally made by a sm y Yunanese trader in the furtherath century. A large party was organite for the purpose of returning to procure more from the same place, but in appear to have been unsuccessful. Another attempt was magaber by My Yunan Government in the fourteenth century. A large party was organite the explanation of the stade country seems to h <sup>1</sup> J <sup>1</sup> Yunan Government in the fourteenth century, and a smart of the stade opered out between the stade on outries. Adventurous bands of Chinese soon discovered that the jar outries districts an one there explaration of the stade opered out between the supper to the expansion of the trade, and us                                                                                                                                                                                                  |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul> <li>of the veins observed by Dr. Stoliczka were iofeet thick. Associated with the Jade in these veins a coarsely crystalline white dolomite was found Besides these mines at Karakásh, jade is found in most of the stream issuing from the Kuenlun, and south of Kotan other mines of great an quity exist, which are mentioned as producing Jade by Chinese autom of 2,000 years ago (<i>Bali</i>, <i>Mallett</i>).</li> <li><i>Upper Burma</i>The Mogaung District has long been known to man opportunity of examining, have proved by their specific gravity, "The first estates that all the specimens of Mogaung so-called jade which he has man opportunity of examining, have proved by their specific gravity," The first estates that all the specimens of Mogaung so-called jade which he has man opportunity of examining, have proved by their specific gravity, "The first estates that all the specimens of Mogaung so-called jade which he has man opportunity of examining, have proved by their specific gravity, "The first estates that all the specimens of Mogaung so-called jade which he has man opportunity of examining, have proved by their specific gravity, "The first estates that all the specimens of Mogaung so-called jade which he has man opportunity of examining, have proved by the expedition, and have formed the subject of an exhaustive and interest? Treport by W. Warry, Esq., Political Officer, Bhamo. From this it a pP that the discovery of the mineral was accidentally made by a sn Yunanese trader in the thirteenth century. A large party was organise for the purpose of returning to procure more from the same place, but it appear to have been unsuccessful. Another attempt was made by, human by the Chinese till 1784, when, on the termination of nostill between China and Burma, a regular trade opened out between? The ange of the importance of the Jade trade and of the revene with mark by the Chinese at an an an comparative present century the Burmese Kings seem to have been aware of the ingortance of the Jade trade and of the revene with</li></ul> | JADE.    | Jade and Jadeite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul> <li>Biffma.</li> <li>Chinese as a source of a very valuable white or greenish "Jade.*</li> <li>states that all the specimens of Mogaung so-called jade which he has not an opportunity of examining, have proved by their specific gravity.</li> <li>Itiy, texture, hardness, and colour to be Jadeite, a mineral which the Chinese hold in higher value than true Jade or Nephrite. The WKHA mines were first described by Dr. Anderson in his Report on the Expeait to Yunan, 1871, but since the British occupation, they have attracted my attention, and have formed the subject of an exhaustive and interest: a report by W. Warry, Esq., Political Officer, Bhamo. From this it a p P that the discovery of the mineral was accidentally made by a sm Yunanese trader in the thirteenth century. A large party was organise for the purpose of returning to procure more from the same place, but th appear to have been unsuccessful. Another attempt was made by J. Yunan Government in the fourteenth century, but all the members of the expedition are said to have perished by malaria or at the hands of has hill tribes. No further exploration of the Jade country seems to hj^ J. J. Smade by the Chinese till 1784, when, on the termination of nosti II between China and Burma, a regular trade opened out between^* the trade state supply of the stone was now conveyed every year to the many producing districts lay on the right bank of the Uru river, and a smau regular supply of the stone was now conveyed every year to the mark period. In 1806 a Burnese Collectorate was estations at the site of what is now the town of Mogaung, and a guard was 'S' ly stationed at the mines to protect the trade and to maintain.</li> <li>"Mogaung now became the head-quarters of the Jade c^^ I at the site of what is now the town of Mogaung, and a guard was 'S' ly stationed at the mines to protect the trade and to maintain.</li> <li>"Mogaung now became the head-quarters of the Jade c^^ I at the site of what is now the town of Mogaung and a guard was 'S' ly stationed at the mi</li></ul>     | SOURCES. | of the veins observed by Dr. Stoliczka were iofeet thick. Associated with<br>the Jade in these veins a coarsely crystalline white dolomite was found<br>Besides these mines at Karakash, jade is found in most of the stream<br>issuing from the Kuenlun, and south of Kotan other mines of great an<br>quity exist, which are mentioned as producing Jade by Chinese autnor<br>of 2 000 wears ago ( <i>Rall: Mallatt</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| J-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -        | Upper Burma.—The Mogaung District has long been known to the Chinese as a source of a very valuable while or greenish "Jade." And states that all the specimens of Mogaung so-called jade which he has an opportunity of examining, have proved by their specific gravity, the state states that all the specimens of Mogaung so-called jade which he has an opportunity of examining, have proved by their specific gravity, the state schede in higher value than true Jade or Nephrite. The WKH the Chinese hold in higher value than true Jade or Nephrite. The WKH the Chinese hold in higher value than true Jade or Nephrite. The WKH the discovery of the British occupation, they have attracted my attention, and have formed the subject of an exhaustive and interest? The report by W. Warry, Esq., Political Officer, Bhamo. From this it a p that the discovery of the mineral was accidentally made by a sm Yunanese trader in the thirteenth century. A large party was organise for the purpose of returning to procure more from the same place, but in appear to have been unsuccessful. Another attempt was made by J. Yunan Government in the fourteenth century, but all the members of the specific on are said to have perished by malaria or at the hands of host hill tribes. No further exploration of the Jade country seems to hj^ J^ je made by the Chinese till 1784, when, on the termination of nostill between China and Burma, a regular trade opened out between^ the fact producing districts lay on the right bank of the Uru river, and a smart or gular supply of the stone was now conveyed every year to the stone. Early in the present century the Burmese Kings seem to have been unsurted by the season. The state set of what is now the town of Mogaung, and a guard was '' '' ''''''''''''''''''''''''''''' |

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|                                                                                                                                                                                                                                                                                                                                                 | Jade and Jadeite,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (J. Mwray)                                                                                                                                                                                                                                                                                                                              | JADE.                                                                                   |  |
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| ey from the former.<br>Under the system j<br>any years. The po-<br>ears 1831-40, durin<br>annually engaged is<br>ent by one of the a<br>r^at emporium of<br>s of Cantonese mo-<br>tities and carried it<br>n 1841 war broke o<br>commenced at Canto-<br>king itself felt. C<br>unan-fu. Stocks a<br>e mines. The Ka<br>e urgent representations | nes and at Namiakyaukseik<br>st described the Jade trade c<br>iod of its greatest prosperity<br>which time at least 800 Chi<br>business or labour at the mi<br>ove mentioned routes to Yur<br>ne trade. The business ther<br>chants, who bought the ro<br>ack to be cut and polished a<br>t between Great Britain and<br>n, and the effect on the Jade<br>ntonese merchants no longer<br>cumulated, and Yunan trac<br>hins, suffering from this st<br>ons to the Burmese at Moga<br>from Mogaung to Momein<br>Chinese traders that they di | continued to flourish<br>is comprised within<br>inese and 600Shans<br>ines. All the stone<br>man-fu, at this time<br>was mainly in the<br>ugh stone in large<br>t Canton<br>China. Hostilities<br>trade was not long<br>came to buy stone<br>ders ceased to go up<br>toppage of business,<br>ung; and in 184.2 a<br>n to inquire if any | SOURCES.<br>Upper<br>Burma.                                                             |  |
| e mines.<br>There was a partia<br>1846, but the distur<br>ing rebellion of 18<br>reak of the Panthay                                                                                                                                                                                                                                            | revival of the trade for a fev<br>ed state of Southern China, o<br>), prevented a complete rec<br>rebellion in 1857 the roads le<br>usiness in Jade came to a s                                                                                                                                                                                                                                                                                                                                                                            | w years commencing<br>consequent upon the<br>covery; and with the<br>eading to Yunnan-fu                                                                                                                                                                                                                                                |                                                                                         |  |
| ate that the averaged R 6,000, the out<br>of R 6,000, the out<br>l. About the yea<br>000 was the probab-<br>uty fell to R3,000 o<br>e estimates are pr                                                                                                                                                                                          | t of the period just passed in<br>e amount of duty collected<br>it of Jade being small and the<br>1836, when the trade was<br>a amount of the annual coll<br>less, and then it dwindled ar<br>bably below the mark, as the<br>ed to understate the real am                                                                                                                                                                                                                                                                                 | each year did not<br>he official appraisers<br>as most flourishing,<br>lection. After 1840<br>wav to nothing. The<br>e Chinese would, for                                                                                                                                                                                               |                                                                                         |  |
| The year 1861 with<br>date until now th<br>con. In 1861 the fi-<br>ton. In 1861 the fi-<br>sing a large fortune<br>wed by other Cant<br>numerous Yunanes<br>now at Sanka. S-<br>nad been pronounce<br>orking. Now, how<br>rior to that from th<br>ged, matured and d                                                                            | sed a great improvement in t<br>bulk of the stone has bee<br>st Cantonese merchant arrive<br>cks of Jade and conveyed th<br>on this single venture. His of<br>nese, and once more the tra<br>went up to the mines. Th<br>ne had been discovered ther<br>poor in quality and scarce<br>ver, upon a second trial, it pr<br>earlier mines, the colour hav<br>epened in the interval. The                                                                                                                                                      | he Jade trade. From<br>en carried by sea to<br>ed in Mandalay. He<br>nem to China by sea,<br>example was quic kly<br>ade in Jade revived,<br>he principal quarries<br>re many years before<br>ly worth the trouble<br>roved to be equal or<br>ring, as the Kachins<br>annual duty collect-                                              |                                                                                         |  |
| now at Sanka. S<br>nad been pronounce<br>orking. Now, how<br>rior to that from th<br>ged, matured and d<br>t this time probably<br>Hitherto the collect                                                                                                                                                                                         | ne had been discovered ther<br>poor in quality and scarce<br>/er, upon a second trial, it p<br>earlier mines, the colour hav                                                                                                                                                                                                                                                                                                                                                                                                               | re many ye<br>ly worth t<br>roved to be<br>ring, as th<br>annual du<br>).<br>ne hands o                                                                                                                                                                                                                                                 | ears before<br>the trouble<br>e equal or<br>he Kachins<br>uty collect-<br>f an official |  |

"Hitherto the collection of the duty had been in the hands of an official who had paid a very high price at Ava for his appointment and who was in the habit of remitting to the capital only as much as he thought fitusually about one-fifth—of the actual receipts. In 1866 the tax was farmed out for the first time. The price obtained was R 60,000 for a three years' lease. At the expiration of this term the King, dissatisfied with the amount of the Jade revenue, determined to buy all the stone from the Kachins himself, and appointed a high official to act as his agent at the mints. For a whole season Chinese and other dealers in Jade were excluded from the mines. The stone, as it was dug up, was purchased by

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| JADE.                       | Jade and Jadeite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| SOURCES.<br>Upper<br>Burma. | the King's agent, carried to Mogaung, and there retailed to the traders.<br>This arrangement was of course highly unsatisfactory to the Kachins, who<br>first protested against the exclusion of other purchasers, and then, finding<br>their protest of no avail, resorted to the much more effectual method or<br>curtailing the supply of stone and producing only pieces of indifferent<br>quality. For this reason the King's experiment was a failure, and the<br>total revenue he secured did not equal the proceeds derived from the sale<br>of the monopoly in the preceding year. The Chinese explain the failure<br>on other grounds. The experiment, they say, was doomed from the out-<br>set 'owing to the inherent impropriety of a sovereign descending into<br>the arena of trade and taking the bread out of the mouths of his own<br>subjects.'<br>" During the years 1870, 1871, and 1872 the King obtained an a <sup>#11</sup> "# <sup>1</sup><br>remittance of R 12,000 from the Collector at Mogaung on account of the<br>Jade duty. In the following year new deposits of fine Jade were discover-<br>ed at Mantiemmo, and the King again determined to become the sole<br>purchaser from the Kachins. On this occasion, too, the revenue he realised<br>fell far below the average of former years.<br>"In 1874 the old system was reverted to and the collection amounted to<br>R6,000. Once more, in 1875, <sup>Ine</sup> King undertook to buy the stone himselt<br>from the Kachins, and again the experiment failed, though not so badly<br>as on the two previous attempts. About this time the Iku quarry was<br>discovered, and the output being very good the right of collecting the 9SJY<br>was sold in 1876 for three years for the sum of R60,000. In 1880 Wu<br>Chi, the son of a Canton Chinaman by a Burmese mother, "bial" here Jieg<br>three-years' lease of the monopoly at the rate of R50,000 a year. In the<br>second year of his term* the Tomo quarries were opened and he made a <sup>11</sup><br>immense fortune. j<br>" In the autumn of 1883 Mogaung was sacked by the Kachins, and<br>during the ensuing winter and spring there was no trade in J <sup>ade</sup> / 1 <sup>11</sup><br>June 1884, |
| fethod of<br>Mining.<br>6   | with the traders, were permitted to collect duty at Bhamo instead or, as<br>h t f t Mogaung. During the first two years of their term, "Will'S<br>to the disturbances connected with the adventure of Hsiao Chin and the<br>British occupation of Upper Burma, they collected little or no duty 5 out<br>the proceeds of the third year left them with a margin of R2O,oooover ana<br>above their total expenses for the three years." frmej<br>The tax (at the same rate of 33 per cent, ad valorem) was then a rmmed<br>out by the British Government to a Cantonese lessee for about "50" and<br>who appears to have been very strict in exacting his rights, levied new^athe<br>unauthorised taxes* and made every endeavour not only to *J <sup>ollec</sup> J<br>duty, but to get the management of the mines into his own hands. 'As a<br>result he became extremely unpopular, and in 1887 was assaulted ana<br>outraged at Mogaung.<br><b>quarter Holestribely No follo Web protocole for stone</b> they are guided by indica-<br>tions furnished by burning bamboos; when it is discovered, favourable<br>omens are anxiously awaited before the discovery is announced to the Iva-<br>chin community. A meeting is then convened by the Chief Sawbwa,<br>and again sacrifice and other methods of divination are resorted to in<br><b>I</b> 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Jade and Jadeite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | JADE.                  |
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| remain undisturbed for a<br>chin belief—is sufficiently<br>the immediate opening of<br>stone is marked out by r<br>then apportioned among<br>to the same family is refu<br>"Tne ground thus pa<br>after an elaborate ceren<br>mences. A similar ceren<br>season. This year (1888<br>an abundant output bein<br>behalf of the Emperor o<br>occasion of the Emperor<br>sum amounting to four la<br>Jade for use at the cer<br>to the trade in Burma.<br>"The Kachins have al<br>mines. They have, how<br>them, and in the early da<br>ries temporarily abandone<br>the labour severe and the<br>many years contented the<br>by Kachins.<br>"The season for Jade<br>May, when the unhealth                          | mine should be worked a<br>period of years until the c<br>matured. If the indicati<br>the mine, the land at and an<br>opes into small plots a few<br>all the Kachins present.<br>sed a share, no matter how<br>rcelled out, traders are in<br>ionial it is declared open<br>nonial is held at the open<br>) the sacrifices were on an<br>g desired in order to mee<br>f China who is to be man<br>r Tungchih's marriage in<br>khs of rupees was expende<br>emony, and a great impu-<br>ways claimed the exclusive<br>ever, from time to time al<br>ys Chinese were permitted<br>ed by the Kachins. The C<br>is results unsatisfactory, a<br>emselves with buying stone<br>e operations begins in Nov-<br>iness of the climate comp-<br>mines suspends further op | olour—such is the Ka-<br>tons are favourable to<br>round the out-cropping<br>y feet square which are<br>No Kachin belonging<br>y far away he may live<br>vited to the mine, and<br>and the digging com-<br>ing of each successive<br>unusually large scale,<br>et expected orders on<br>ried shortly* On the<br>1872 it is said that a<br>d at Canton in buying<br>ilse was thereby given<br>right of digging at the<br>llowed Shans to assist<br>to work certain quar-<br>hinese, however, found<br>nd they have now for<br>brought to the surface<br>wember and lasts until<br>els all traders to leave | SOURCES.<br>Upper Burm |
| the Kachins.<br>"This flooding of the<br>est difficulty with which the<br>much labour and money<br>meet it. There were at the<br>over some of the largest<br>When the floor of the pitte<br>a rule possible only in H<br>at the base of the stone.<br>Hous heat, in order to det<br>the Kachins immediately<br>detach portions by hauling<br>be done when the stone<br>protect themselves from<br>leaves round the exposed<br>as severe in the extreme<br>any consideration. The<br>op of the mine, and the<br>siderable each season. The<br>siderable each season. The<br>for digging was jealously<br>hat under present conditioned the stone<br>interval of the mine in the stone of the stone of the season. | deepest and most productiv<br>he Kachins have to contend<br>in devising expedients, with<br>he time of our visit elabor<br>quarries for the purpose of<br>can be kept dry for a few<br>February and March,—im<br>A careful watch must then<br>ect the first signs of splittin<br>attack the stone with pick<br>g on levers inserted in the<br>is at its highest tempera<br>the fierce heat by fasten<br>parts of their persons. The<br>and such as only a Kachin<br>heat is insupportable ever<br>mortality among the actual<br>the Chinese take a malicion<br>he carly days when quarry<br>withheld from outsiders;<br>ons they need not be appre                                                                                                               | ve quarries is the great-<br>d, and they have spent<br>h indifferent success, to<br>ate bamboo structures<br>baling out the water.<br>hours,—and this is as<br>mense fires are lighted<br>h be kept, in a tremen-<br>ng. When these occur<br>axes and hammers, or<br>crack. All this must<br>ture, and the Kachins<br>ing layers of plantain<br>he labour is described<br>n would undertake for<br>h for onlookers at the<br>l workers is very con-<br>us pleasure in remind-<br>ing was easy the right<br>and they assure them                                                                           |                        |
| the trade in the stone in I<br>"The demand for Jad<br>the best stone shows no t<br>source of the supply, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | resent condition of the Jade<br>Burma, Mr. Warry writes :-<br>e is universal throughout C<br>endency to fall. Burma is<br>there seems no reason to<br>the demand. Considerin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |

| JADE.                                           | Jade and Jadeite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| JADE.                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| SOURCES.<br>Upper Burma.                        | which the Jade stone has at one time or another been discovered, the im-<br>practicable nature of the country, covered for the most part with thick<br>jungle, and the rough character of the prospecting, which consists merely<br>in examining large and obvious outcropping stones, it is probable that the<br>jade hitherto discovered bears a very small proportion to that still con-<br>cealed. It is likely, therefore, that in the Jade country our Government<br>possess a source of revenue capable of considerable development. Put-<br>ting out of sight the probability of future discoveries of jade, there is no<br>doubt that the revenue derived from the present mines might be much im-<br>proved if free access could be obtained to the country. The introduction<br>of European appliances, which should supersede the present injurious<br>method of working the quarries, would add considerable value to the<br>output, a good part of which is now calcined by the action of heat. *^!? <sup>d</sup><br>the smuggling of stone overland to China would at the same time be<br>effectually prevented."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| TRADE.<br>7<br>MEDICINE.<br>8<br>DOMESTIC.<br>9 | <ul> <li>The or inclusion and the include of revying it is in present under the consideration of Government.</li> <li>Trade.—For a statement of the exports from Burma during the years from 1880 to 1386 the reader is referred to the articles Cornelain, Voh 1*** 168. In continuation of the table there given, it may be stated that the exports in the last year for which statistics are available (1888-89) were 4,898 cwt., value R6,54,040.</li> <li>It would thus appear that the lade trade from Burma which had seemingly fallen off from 1881-82 onwards has again begun to revive, and hopes may be entertained that it will continue to increase as the country becomes more settled.</li> <li>A considerable amount of a false Jade, in reality serpentine, is JTYP<sup>4</sup></li> <li>ed into the Panjab from Afghanistan. It is said to be found near Kandahar, and to be brought down the Indus on rafts floated with inflated skins to Attock, whence it is earned to Bhera in the Shahpur district to be used in the manufacture of knife-handles.</li> <li>Medicine.—Liquor drunk from a Jade or Agate cup is supposed to allay palpitation of the heart, and the cup itself is believed to act as a protection against poisoning.</li> <li>Domestic—Cups, vessels, and ornaments of Jade are highly valued oy the Chinese, and also by certain classes in India. Not only are its hardness, weight, sonoriety and peculiar sombre tint admired, but wearing the stone is supposed to impart to the warer many good qualities and -virtues, Easy to work when first extracted, Jade acquires a considerable degree of hardness after exposure, a property which together with its toughness readers it very useful as a material for ornaments. In Burma, it is principally employed in the manufacture of these ornaments is at Momein, where the stone, according to Dr. Anderson, is cut by means of circular disco 91 copper and rotating conical tipped cylinders, 'charged with siliceous mua and what appears to be ruby dust. At Momein a pair of bracelets of the finest Jade cost about Rioo. The mo</li></ul> |

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| The Jasmine. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | JASMINUM<br><b>arborescen<u>s</u>*</b>             |
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| as the true article. Perhaps the most commonly employed of these, in<br>India, is the Afghan Jade-like serpentine, which is largely used in Bher<br>(Shahpur district) for making hilts of <i>peshquabz</i> (or Afghan knives), and<br>of the hunting or dinner knife. Baden Powell describes the method of<br>cutting this stone as follows:—" The pale green plasma called * <i>sang-%</i><br><i>yesham'</i> is cut by means of an iron saw, and water mixed with red san<br>and pounded * <i>kurand'''</i> (corundum). "It is polished by application to<br>the ' <i>sin</i> ''' (polishing wheel), " wetted with water only, then by bein<br>kept wet with water, and rubbed with a piece of • <i>wdtt</i> * (a smooth fragmen<br>of stoneware, pottery or potshera), and lastly by rubbing very finely pound<br>ed burnt <i>santr-i-yesham</i> on it. This last process must be dc;ne ver<br>thoroughly. The other stones used for handles come from the Salt Rang<br>an£ the hills near Attock."                                                         | a j<br>d !<br>of [<br>d<br>a<br>g<br>ht<br>d-<br>y |
| Jaggery, see Borassus flabelliformis, <i>Linn.</i> (Vol. I., 495); Caryota urer<br><i>Linn.</i> (Vol. II., 208), Cocos nucifera, <i>Linn.</i> (Vol. II., 449), also Phoen<br>sylvestris, <i>Roxb.</i> ; Vol.V. Consult also the article, Narcotics, Vol. V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                    |
| Jalap, see Ipomcea purga, <i>Hayne;</i> see p. 488.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                    |
| JASMINUM, Linn.; Gen. PL, II., 674.<br>A genus of scandent or erect shrubs, belonging to the Natural Order<br>OLEACRIE, and comprising 90 species distributed over the tropics or warm tem-<br>perate parts of the Old World. Of these, some 43 arc natives of India.<br>Jasminum angustifolium, Vahl.; Fl. Br. Ind., III., 598 / Wigh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <i>t</i> . 10                                      |
| [ <i>Ic.</i> , <i>t.</i> 6g8 ; OLEACEJ<br><b>Syn.</b> —JASMINUM VIMINEUM, <i>Willd.</i> ; J. TRIFLORUM, <i>Pers.</i> ; NYCTAN<br><b>THES ANGUSTIFOLIA</b> , <i>Linn.</i> ; N. VIMINEA, <i>Retz.</i> ; N. TKIFLOKA, <i>Burm.</i> ;<br>MOGORIUM VIMINEUM, <i>Lamk.</i> ; M. TRIFLORUM, <i>Lamk.</i><br><b>Vern.</b> — <i>Mwari</i> , <i>ban-mallica</i> , HIND. ; <i>Chattu mallika</i> , <i>caat-mallica</i> % <b>TAM.</b><br><i>Chiri malle</i> , <i>adeuie-mallie</i> , TEL. ; <i>Kat'i-pitsjegam</i> , MALAY.; <i>Walsama</i><br><i>pichcha</i> , SING. ; <i>Kanzna muHika</i> , <i>cuphota</i> , <i>vana malli</i> , SANS.<br><b>References.</b> — <i>Roxb.</i> , <i>Fl. Ind.</i> , <i>Ed. C.B.C.</i> , 32; <i>Elliot</i> , <i>FL Andhr.</i> , 42<br><i>Ainslie</i> , <i>Mat. Ind.</i> , <i>II.</i> , 52; <i>Drury</i> , <i>U. PL</i> , 267 ; <i>Balfour</i> , <i>Cyclop.</i> , <i>II</i><br><i>419</i> ; <i>Treasury of Bot.</i> , /., 636 ; <i>Gazetteer</i> , N W. P., /., 82.<br>Habitat.—A common shrub on the lower hills of the Deccan an<br>Ceylon. | N-<br>J<br>n<br>2;<br>.,<br>d                      |
| Medicine.—Ainslie writes : <sup>%</sup> The bitter ROOT, ground small and mixed<br>with powdered <i>vassnmboo</i> (root of Acorus Calamus) and lime-juice, is con-<br>sidered a valuable external application in cases of ringworm."<br>Domestic.—Roxburgh says : " It grows easily in ever}' soil and situa-<br>tion, is constantly covered with leaves, the bright, shining, deep colour of<br>which renders it always beautiful, and particularly well adapted for screen<br>ing windows, covering arbours, &c."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | n- Root.<br>II<br>a- DOMESTIC.<br>f 12             |
| <ul> <li>J. arborescens, Roxb. / FL Br. Ind., III., 594 / Wight, Ic, t. 6pg.<br/>Syn.—JASMINUM MONTANUM, Roth; J. ARDOREUM, Rcem.</li> <li>VAR. latifolia, Roxb.; Wight, Ic, t. jo3.</li> <li>VAR. montana, Roth; J. PUNCTATLJM, Wall.; J. GLABELLUM, Wall.</li> <li>Vern.—Saptala, nava-mallika, bela, muta-hela, HIND.; Bura-kānda<br/>nuva-mullika, BRNG.; Gada hund baha, SANTAL; Kussar, BOMB,<br/>Kusara, MAR.; Adavi malle, TEL.; Saptala, nava-mallika, madhy<br/>SANS.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 32; E/andis, For. FL, 3IT<br/>Dalz &amp; Gibs., Bomb. FL, i3S; Works of Sir W. Jones, V., 73; Rev. A<br/>Campbell, Ec. Prod., Chutia Nagpur, No. 9277; Elliot, Fl. Andhr., 1/<br/>Dymock, Mat. Med. W. Ind., 2nd Ed., 475 / Atkinson, Him. Dist., J/H<br/>Lhboa, U. PL Bomb, 223; Balfour, Cyclop., II., 420; Indian Foreste<br/>VI., 321; XL, 273; Gaaelteen;—Bombay {XV., 71}, 437; NW. F<br/>IV., 74*</li> </ul>                                                                                                           | 1»<br>; j<br>; l,                                  |
| J.13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                    |

| JASMINU              |                                                                                                                                                                                                                                                                                                                                       |
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| grandiflor           |                                                                                                                                                                                                                                                                                                                                       |
|                      | Habitat.—A large shrub, or scrubby tree, native of the Tropical North-<br>West Himálaya, also of the hot lower hills of Southern India and Ceylon<br>at altitudes from 500 to 3,000 feet. <i>Var.</i> latifolia occurs along the base<br>of the Himálaya from Kumáon to Bengal, while <i>var.</i> montana is a native<br>of the Decem |
| OIL.                 | of the Deccan.                                                                                                                                                                                                                                                                                                                        |
|                      | Oil.—Lisboa mentions this species in his list of oil-yielding plants, and                                                                                                                                                                                                                                                             |
| I *<br>MEDICINE.     | states that a volatile oil may be obtained from it by distillation.                                                                                                                                                                                                                                                                   |
| 15                   | Medicine.—The Rev. A. Campbell states that a preparation of the plant is given by the Santals in cortain monotrul complaints. Dymosk de                                                                                                                                                                                               |
| 15                   | plant is given by theSantals in certain menstrual complaints. Dymock de-<br>scribing <i>var</i> . latifolia writes: "The JUICE OF THE LEAVES is used with                                                                                                                                                                             |
|                      | Experies for a dose. For young children the juice of half a leaf and of four $\int_{a}^{a} h^{\mu} e^{s} t$                                                                                                                                                                                                                           |
|                      | of agdsta (Sesbania grandiflora) may be mixed with two grains of black                                                                                                                                                                                                                                                                |
| Leaves.<br><b>16</b> | pepper, and two grains of dried borax and given in honey." S. Arjun ( <i>Cat. Bomb. Drugs, 89</i> ) states that the LEAVES of the same variety are                                                                                                                                                                                    |
| -                    | slightly bitter and astringent, and might be used as a tonic and stomachic.                                                                                                                                                                                                                                                           |
| FOOD.                | Food.—The seeds of <i>var.</i> latifolia were eaten at Poona during the                                                                                                                                                                                                                                                               |
| 17                   | famine of 1877-78.                                                                                                                                                                                                                                                                                                                    |
| 18                   | Jasminum grandiflorum, Linn.; Fl. Br. Ind., III., 603; Wight,                                                                                                                                                                                                                                                                         |
| Į                    | THE SPANISH JASMINE. [/<•., /. 1257*                                                                                                                                                                                                                                                                                                  |
|                      | Syn.—JASMINUM AUREUM, Don.                                                                                                                                                                                                                                                                                                            |
|                      | Vern.—Chdmeli, jdti, HIND.; Jdti, BENG.J Jdhi, NW.P.; Ckamba,<br>chamheli, jati, PB.; Cka?nbeli, BOMB.; Ghambeli, Guz.; Jaji, TEL.i<br>Myatla, BURM. ; Jdti, SANS.                                                                                                                                                                    |
|                      | References.—Roxb. Fl. Ind., Ed. C.B.C., 34: Brandts, For. Fl., 3'3:                                                                                                                                                                                                                                                                   |
|                      | Kurz, For. Fl. Burm., II., 150; Gamble, Man. Timb., 255; Stewart, ro.<br>PL, 141; Sir William Jones, V., 74; Elliot, Fl. Andh., 12; Maşon,                                                                                                                                                                                            |
|                      | Burma and Its People, 409, 802; U. C. Dutt, Mat. Med. Hind., 190, J••>'<br>Dymock, Mat. Med. W. Ind., 2nd Ed., 474; Baden Powell, Pb. Pr.,359i<br>Atkinson, Him. Dist., 740; Piesse, Art of Perfumery, rtfrW ! Balfour,                                                                                                               |
|                      | Cyclop., II., 420; Treasury of Bot., I., 626; AgriHort. Soc. of India,<br>Jour. X. (Old Series), IS i IV. (New Series), 118; Gazetteers: - Mysore                                                                                                                                                                                     |
|                      | and Coorg, II., 7; NW. P., IV., 74; I., 82; X., 3T3.<br>Habitat.—A large, scandent, glabrous shrub, found wild in the SUD-                                                                                                                                                                                                            |
|                      | tropical North-West Himalaya, at altitudes from 2,000 to 5,000 feet, often                                                                                                                                                                                                                                                            |
|                      | cultivated throughout India.                                                                                                                                                                                                                                                                                                          |
| OIL.                 | Oil.—The fragrant FLOWERS are used in India for preparing a scented                                                                                                                                                                                                                                                                   |
| Flowers.             | oil, which is considered cooling and is much prized by the richer classes                                                                                                                                                                                                                                                             |
| 19                   | of Natives. In certain localities such as Kumaon it is also employed for                                                                                                                                                                                                                                                              |
| [                    | making perfumed waters. In Europe, the flower of the Spanish Jasmine is                                                                                                                                                                                                                                                               |
|                      | very highly esteemed by the perfumer, owing to the delicacy and sweetness                                                                                                                                                                                                                                                             |
| 1                    | of its odour, and to the fact that it is impossible to imitate it by artificial combinations. Piesse states that the chief source of Jasmine oil is near                                                                                                                                                                              |
|                      | Cannes in the South of France, where the plant is largely cultivated. An                                                                                                                                                                                                                                                              |
|                      | acre of land yields about 500ft of blossom, which is said to be bought                                                                                                                                                                                                                                                                |
| · · · · ·            | by manufacturing perfumers at the rate of is. 6d. to 2s. 6d. the pound.                                                                                                                                                                                                                                                               |
| l                    | In the perfumer's laboratory the method of obtaining the odour is by                                                                                                                                                                                                                                                                  |
|                      | absorption or "enfleurage." In this process the flowers are sprinkled over                                                                                                                                                                                                                                                            |
|                      | a layer of lard and beef suet, the operation being repeated every few                                                                                                                                                                                                                                                                 |
|                      | days with fresh flowers as long as the plants remain in blossom. The                                                                                                                                                                                                                                                                  |
|                      | grease absorbs the odour, and is finally melted at as low a temperature<br>as possible and jtrained. Oils are similarly prepared, a cotton cloth                                                                                                                                                                                      |
|                      | steeped in olive oil being substituted for the layer of lard and suet. The                                                                                                                                                                                                                                                            |
|                      | extract of jasmine is prepared by adding one quart of rectified spirit to                                                                                                                                                                                                                                                             |
|                      | two pounds of jasmine fat or oil, and leaving the mixture to stand for a                                                                                                                                                                                                                                                              |
| ſ                    | fortnight at summer heat. The extract is then strained off, and the still-                                                                                                                                                                                                                                                            |

**J.** 19

| Oil of Jasmine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ( <b>§.</b> Murray.) J                                                                                                     | ASMIN UM<br>humile.                                          |
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| scented residue of fat or oil is sold as pomatum or hair of<br>highly valued, and enters into the composition of a g<br>handkerchief perfumes of Europe. From Jasmine oil<br>phor has been separated, which is inodorous, fusible at 1<br>in water and easily soluble in spirit and ether. It has<br>Gmelin that this so-called camphor may be a fatty acid.                                                                                                                                                    | great many of the<br>a crystalline cam-<br>25 <sup>0</sup> , hardly soluble<br>been suggested by                           | OIL.                                                         |
| Medicine.—The plant has long been known and<br>Sanskrit and Muhammadan writers. The former believ<br>from the FLOWERS to be cooling when applied externa<br>be of value internally, in cases of skin diseases, aphthae,                                                                                                                                                                                                                                                                                         | recommended by<br>re the oil prepared<br>lly, the LEAVES to                                                                | MEDICINE.<br>Flowers.<br><b>20</b>                           |
| the FRESH JUICE OF THE LEAVES to be a valuable app<br>between the toes. According to Muhammadan writers<br>struent, anthelmintic, diuretic, and emmenagogue. The                                                                                                                                                                                                                                                                                                                                                | olication for corns<br>the plant is deob-<br>flowers made into                                                             | Leaves.<br>21                                                |
| a p <sup>1</sup> aster are also supposed to act as an aphrodisiac (<br>&c.) Atkinson states that in the North-Western Provi<br>and their essence are used as an application in skin d<br>and weak eyes; the leaves are used in toothache."                                                                                                                                                                                                                                                                      | nces "the flowers                                                                                                          | Juice.<br>22                                                 |
| SPECIAL OPINIONS.—§ "The leaves when chewed a<br>ulceration of the mucous membrane of the mouth. Boi<br>likewise frequently used with benefit for the same<br>Surgeon C. J. W. Meadows, Barrisal). "The oil is<br>as an external application to the healthy skin to protect<br>of dry and cold winds" (Surgeon-Major A. S. G. Jaya                                                                                                                                                                              | led in ghi they are<br>affection " ( <i>Civil</i><br>largely employed<br>t it from the effects                             |                                                              |
| Structure of the Wood.—Similar to that of J. offic<br>nia and Turkey the plant is cultivated for its long str<br>are made into slender pipe-tubes, much prized by the M                                                                                                                                                                                                                                                                                                                                         | inale. In Catalo-<br>aight stems, which                                                                                    | TIMBER.<br>23 ,                                              |
| Jasminum humile, Linn.; FL Br. Ind., HI., 602; W<br>Syn.—JASMINUM CHRYSANTHEMUM, Roxb.; J. REV<br>BIGNONIACEUM, Wall,; J. WALLICHIANUM, Lin<br>Jacquem.<br>Vern.—Malto, pitmalti, HIND.; Svarnajui, BENG.;<br>Chamha,juari, tsonu, summun, jdi, kuja, sim, ri,<br>ti, naugei, PB.; Pachcha adavimolla, TEL.; Svarn<br>pikd, SAN<br>References.—Roxb., FL Ind., Ed. C.B.C., 33; Bra                                                                                                                              | VOLUTUM, Sims.; J.<br>dL; J. INODORUM,<br>Sonajahi, KUMAON;<br>shing, paring, mdr-<br>iajuthikd, hemapush-                 | 24                                                           |
| References.—Roxb., FL Ind., Ed. C.B.C., 33; Bre<br>Gamble, Man. Timb., 25\$; Stewart, Pb. PL, 141<br>69> '39; Aitchison, FL Kuram Valley, 147; Stewa<br>zara and Khdgdn, in Jour, AgriHort. Soc. o<br>Series), (App. i§; U. C. Dutt, Mat. Med. Hind<br>Powell, Pb. Pr.,359; Atkinson, Him. Dht.,3i3; L<br>McCann, Dyes and Tans, Beng., 154; Balfour, Cyc<br>Forester\ II., 2\$, 26; V., 184; XII., App. 16 and L<br>P., IV, 74-                                                                                | ., 299, 519; Baden<br>Drury, U. PL, 267;<br>clop., II., 420; Indian<br>28; Gazetteer, NW.                                  |                                                              |
| Habitat.—A small, erect, rigid shrub, native of the<br>laya from Kashmir to Nepal, at altitudes from 2,000 to<br>also in South India and Ceylon, from 2,000 to 6,000 fee<br>in gardens throughout India.                                                                                                                                                                                                                                                                                                        | o 5,000 feet; found<br>t; widely cultivated                                                                                |                                                              |
| Dye.—Aitchison states that in the Kuram Valley a<br>tracted from the ROOTS. It is curious that this fact sh<br>unknown to the hill tribes in India where the plant is equ<br>dye-stuff much used in Chittagong under the nqme j<br>possibly be derived from this jasmine (Dr. G. Watt)*<br>Oil.—Like many other jasmines, this species bear<br>yield an aromatic essential oil, used in Native perfume<br>Medicine.—The ROOT is said to be useful in ringwo<br>SPECIAL OPINIONS.—§ '• The milky JUICE which ex- | aould apparently be<br>bally abundant. A<br>bari may, however,<br>rs FLOWERS which<br>ry.<br>form ( <i>Baden Powell</i> ). | Roots.<br>25<br>OIL.<br>Flowers.<br>26<br>MEDICINE.<br>Root. |
| in the bark of this plant, is alleged to have the power                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                            |                                                              |

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| ASMINUM<br>Sambac.  | The Arenien Leemine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| medicine.           | unhealthy lining walls of chronic sinuses and fistulas " (Surgeon-Major                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                     | Bankabehari Gupta, M.B., Pouree).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                     | Jasminum officinale, Linn.; Fl. Br. Ind., III., 603.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                     | Vern.—Chamla, HIND.; Chambeli, KUMAON; Ckamba, chirichog,, kin><br>KASHMIR; Bansu, kwer, diimni, das si, suni, somun, samsem, stm,ri,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                     | shing, páring, márti, naugri,jái, PB.<br>References.—Brandis, For. Fl., 313; Stewart, Pb. PL, W, Boiss.,FU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Orient., IV., 41; O'Shaughnessy, Beng. Dispens., 5'; Balfour, Cyclop.,<br>II., 420; Smith, Die, 227; Treasury of Bot, I., 636.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                     | Habitat.—A climber of the Salt Range and Kashmir, at altitudes from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                     | 3,000 to 9,000 feet. Often cultivated in India, China, and other countries;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| OIL                 | distributed through Cabul and Persia.<br>Oil.—The FLOWERS of this species yield a fragrant oil, similar to that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Flowers.            | already described under J. grandiflora.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>30</b>           | Medicine.—The ROOT has been found useful in ringworm (Stewart).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MEDICINE.<br>Ro?t.  | <b>J. pubescens,</b> Willd.; FL Br. bid., 111., 592; Wight, Ic., t 702, 1248.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 31                  | Syn.—JASMINUM HIRSUTUM, Willd.; J. MULTIFLORUM, Roth; J. ÇQN-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <u>3</u> 2          | GESTUM, Wall.; J. BRACTEATUM (by error "FRACTIATUM"), Wight;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                     | NYCTANTHES PUBESCENS, <i>Ketz.;</i> N. MULTIFLORA, <i>Burm.;</i> MOGORIUM PUBESCENS, <i>Lamk.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                     | VAR. bracteata. Roxb., Hort. Beng.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                     | Vern.—Kund phul, kunda, k&tido, HIND.; K&nd phul, kunda, BENG.J                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                     | Mogra, MAR.; Katu-tsjiregam-mulla, MALAY.; Kunda, SANS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                     | References Rexbourn Ind.; Fd4; CBals, in 385. PBondos, rEgr. 364, 31/><br>Dutt, Mat. Sted. Hind., 306; S. Arjun, Bomb. Drugs, 89; Atkinson                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Him. Dist., 313; Balfour, Cyclop., 11., 420; Gasetteers:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| J                   | HabitatA large tomentose shrub, common throughout <sup>India</sup> . <sup>u</sup> V"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| i<br>I              | an altitude of 3,000 feet; distributed through Burma to China, it is a/s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MEDICIDIE           | frequently cultivated in gardens.<br>Medicine.—S. Arjun states that "the dried LEAVES SOME In" ater and<br>made into a poultice are used in indelent picers to generate a heaithy                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE<br>Leaves. | made into a poultice are used in indolent ulcers to generate a healthy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Deet                | action." The ROOT is said to be an emcient antidote in erect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Root.<br>3*         | bite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 35                  | J. Sambac, Ait.,- Fl Br. Ind., III., 59// Wight, Ic, t. 704.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                     | THE ARABIAN JASMINE.<br>Syn - Leony Nucl Fragrans Salish · J The Lyng Willd. : J. AMBAC,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                     | SynJ <sub>ASMI</sub> Nu <sub>M</sub> FRAGRANS, Salisb.; J. <sup>TM</sup> UL JUM, Willd.: J. AMBAC,<br>?/%h <sup>i</sup> J- Q <sup>IIN</sup> QUEFLORUM, Heyne; J. <sup>244</sup> A ENS, Wall. <sup>*</sup> not of<br>rr cud.; NYCTANTHES SAMBAC and UNUULATUM, Linn.; MOGORIUM                                                                                                                                                                                                                                                                                                                                             |
| ļ                   | we used.; NYCTANTHES SAMBAC and UNUULATUM, Linn.; MOGORIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1                   | SAMBA G. Lam. M. UNDULATUM, Lamk.<br>VAR. 1.— Sambac proper; corolla tube not twice the length of the calyx.<br>VAR. 2.— Herner is corolla tube not twice as long as the calyx teeth.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                     | VAR. 1.— Sambac proper; corolla tube not twice the tangat teeth.<br>VAR. 2.— Heyneana, corolla tube 2 to 5 times as long as the calyx teeth.<br>Vern. = Motion had to be a solar to 5 times as long as the calyx teeth.                                                                                                                                                                                                                                                                                                                                                                                                   |
| í                   | VAR. 2.— Heyneana, corolla tube 2 to 5 times as long as the manalliká, naba-<br>Vera. – Motia, bel, banmalliká, mogra, HIND.; Bel, banmalliká, naba-<br>Wallibá mallih manya Peno, Chambeli, mágra, PB.; Mogri,                                                                                                                                                                                                                                                                                                                                                                                                           |
|                     | mailika, mallik, moora Reno , Chamba, chambeli, magra, PB, TAM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| {                   | Roma, Mourd, MAR. ; Moure, Gur, Stallipps, Malle of Bun malles,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                     | Vern. – Motia, bel, banmalliká, mogra, HIND.; Bel, banmalitká, Mogri,<br>Moliliká, Molilik, Mogra, BNND.; Chamba, chambeli, mágra, PB.; Mogri,<br>Moliliká, Molilik, Mogra, BNND.; Chamba, chambeli, mágra, PB.; Mogri,<br>Bronne, M. Mar.; Morre, Cior, Stalliope, mailight-pu, TAM.;<br>Boate matte, nava málika, malto, TKL.: Mattige, KAN.; Pun mælle,<br>mulhichcha-ptl, muUappt, MALAY.: Thambaumali, sabay,<br>mulhichcha-ptl, muUappt, MALAY.: Thambaumali, sabay,<br>BURM.; PUI-EM-mail (-Mowers), SING; Navantaima, Mistig- vatia-<br>wullikdd, vPanshiki, asphotas SANS.; Saman, sutnan, yasaman,              |
|                     | _ ahvaz, ARAB.; Zambak, gule-supcd, PERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                     | apyaz, ARAB.; Zambak, gule-supca, PERS.<br>References. – Raxb., Fl. Ind., Ed. C.B.C., 30; Brandis, For. Fl., 311;<br>Kurz F. Fl. Function, Fl. Ind., Ed. C.B.C., 30; Brandis, For. Fl., 311;                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                     | Ph. Ph., 141 ; Blivet, Fl., Andhr., 29, 110, 130 ; Moson, Burnta, and<br>Its Post in the fallow, Fl. Andhr., 29, 110, 130 ; Moson, Burnta, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                     | Tor; Moudeen Sherif Supp. Pharm. Ind., 102; U. C. Dutt, Mat. Med.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                     | References. – Raxb., Fl. Ind., Ed. C.B.C., 30; Brandis, For. Fl., Stewarts,<br>Kurs, For. Fl. Burm., II., 153; Dals. & Gibs., Bumb. Fl., 137; Stewarts,<br>Its. For. Fl. Burm., II., 153; Dals. & Gibs., Bumb. Fl., 137; Stewarts,<br>and<br>Its People, 400, 602; Warks of Sir W. Yanes, V., 73, 74; Pharm. Ind.,<br>iss; Moundern Sherly Sorp. Pharm. Ind., 123; U.C. Dutt. Mat. Med.<br>Hind; I 0., 190, 311, 322,335; Hymock, Mai. Jint. It. /mi. 137; Aktin-<br>son, Him. Dist., 313; Drury, U.M., 267; Lisbon, U. PI. Bomb., 22Jt<br>Cat. Baroda Durbar, C. J. Kxhib., No. 119; Balfour, Cyclop., II., 420;<br>I 35 |
| ,                   | Cat. Baroda Durbár, C. J. Kxhib.,No. 119; Balfour, Cyclop., II., 490;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                     | J.35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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| Jasmine Perfume. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | JATROPHA                                |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <u>Curcas.</u>                          |
| <ul> <li>Smith, Dic.<sup>4</sup> 227; Treasury of Bot., I., 636; Ken Off. Guide to the Mus. of Ec. Bot., 94; For. Ad. Rep., Chutia Nagpur, 188\$, 32 • Gazetteers:—Mysore &amp; Coorg, II., 7; Bombay, VII., 40; VIII., 184'-Orissa, II., 179 (App. VI.); NW. P., I., 62; IV., Ixxiv; Madraš Manual of Administration, I., 362.</li> <li>Habitat.—A fragrant climbing shrub, common throughout India. Bur-</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                         |
| ma, and Ceylon, at altitudes up to 2,000 feet; extensively cultivated in the tropics of both hemispheres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                         |
| Oil.—This species, together with J. officinale and J. grandiflorum, is ex-<br>tensively cultivated for its fragrant FLOWERS, fiom which a considerable<br>proportion of the oil of Jasmine used in India is derived (see J. grandi-<br>florum). The method of <i>enfleurage</i> is resorted to in India, as in Europe, for<br>extracting the odorous principle, but instead of fat or oil, crushed sesamum<br>seeds.are employed. Dr. Dymock states that in Persia almonds are simi-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | OIL,<br>Flowers.<br>36                  |
| larly used.<br>Medicine.—The FLOWERS are, in Madras, generally believed to possess<br>considerable powers as a lactifuge. For this purpose about two to three<br>handfuls of the flowers are bruised, and unmoistened are applied to each<br>breast, and renewed once or twice a day. The secretion is sometimes<br>arrested in 24 hours, though the period is more frequently two to three<br>days. Dr. W G. King states in a special opinion quoted below that the<br>action of the fresh flowers is quicker than that of belladonna. The dried                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MEDICINE.<br>Flowers.<br><b>37</b>      |
| LEAVES soaked in water and made into a poultice are used in indolent<br>ulcers. "The ROOT of the wild variety is used as an emmenagogue in<br>Goa" (Dymock). Baden Powell states that this plant is used in the Pan-<br>jdb as a remedy in cases of insanity, in weakness of sight, and affections<br>of the mouth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Leaves.<br>38<br>Root.<br>39            |
| SPKCIAI. OrixiO2*Sm'^—§ "Largely nsotf hy the ri-iffvos an a lactifugc,<br>the flowers being applied externally to the mammae" (Surgeon W. F.<br>Thomas, 33rd Madras Infantry, Mangalore). "The flowers applied over<br>the mammae suppress secretion of milk" (Surgeon-Major A. F. Dobson,<br>M.B., Bangalore). "Stomachic—useful in heart-burn" (Surgeon-Major<br>y. M. Houston, Travancore). "The flowers used as a poultice or wash<br>next to the breast, suppress the secretion of milk" (Surgeon-Major L.<br>Beech, Cocanada). "The fresh flowers when applied to the mammary<br>gland direct, act more quickly as a lactifuge than belladonna" (Surgeon<br>W.G. King, M.B., Madras). "The flowers applied to the breast act as<br>a very efficient lactifuge" (Surgeon-Major J. North, Bangalore).<br>Domestic and Sacred.—The FLOWERS are highly esteemed in the East<br>on account of their fragrance, and are frequently referred to by Arabian,<br>Persian, and Sanskrit poets. Those of one of the double varieties are<br>held sacred to Vishnu, and are used as votive offerings in certain Hindu<br>religious ceremonies. They are also supposed to form one of the darts of<br>Kama Deva, the Hindu God of Love. | DOMESTIC &<br>SACRED.<br>Flowers.<br>40 |
| JATROPHA, <i>Linn.</i> ; <i>Gen. PL, III.</i> , <i>290.</i><br>A genus of woody plants belonging to the Natural Order EUPHORBIACE^E,<br>and comprising <sup>1</sup> about 70 species, chiefly natives of America. Of these, four are<br>indigenous to India, and three others are naturalised or cultivated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         |
| atropha Curcas, Linn.; fl. Br. 2nd, V., 583; EUPHORBIACFJE.<br>Syn.—J. MOLUCCANA, Herb. Russ.<br>Vern.—Bagberenda, saftdind, pdhdri erand, j'angH-arondi, bhernda,<br>bag-bherenda, HIND.; Bdgbkerendd, bon-blierandd, erandd-gdehk, safed<br>ind, paharierand, BENG.; Kulejera, totka bendi,KOL.; Bhernda, SAN-<br>TAL.; Baigab, ORISSA; Kadam, NEPAL; Rattanjot, japhrota, jablota,<br>pun, seeds =jamdlgota, PB.; Mogalieranda, kuruharlu, maraharalu,<br>BOMB.; Mogali eranda, rdna-yerandi, MAR.; Ratanjota, jamalgota,<br>jangli-araudi, Guz.; Erundi, ehandrajot, jangli-yarandi, DEC.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1                                       |
| '35 J. 41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                         |

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| JATROPHA         | Jatropha Oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _Curcas          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                  | <ul> <li>Kattdmanakku, koat amunak, kaat-amunck, caar-noochie, TKM. Mepdlam, adivieamida, pepdlam, TEL.; Maranarulle, maraharalu, bettaaa' haralu, KAN.; Kaak-avenako. kdttd-vanakka, MALAY. 5 Thinbau-kyeHsu, thinbaw-kyetsu, thinban-kyeksu, ke'su-gi, BURM.J Vel-endaru, eramaf* SING.5 Kanana eranda, kanana-kerundum, nepala, paravata-yerattaa, SANS.; Dande-nahri, dande-barri, ARAB. &amp; PERS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 689; Brandtš, For. Fl., 44<sup>2</sup>, Kura.For. Fl. Burm., II., 403; Gamble, Man. Timb., 365; D<sup>TM*1/2</sup> Gibs., Bomb. Fl., 77; Stewart, Pb. PI., 192, 196; Rev. A. Campbell, &amp; Prod., Chutta Nagpur, No. 8426; Mason, Burma and Its People, 5, yo 762; Elliot* Fl. Andhr., i33 / Pharm. Ind., 203; Ainslie, Mat. Ind., **&gt; 45; O'Shaughnessy, Beng, Dispens., 558 ; Moodeen Sheriff, Supp. Thar., Yo Ind., 163 ; U. C. Dutt, Mat. Med. Hind., 302 ; Dymock, IMat. Med., We Ind., 2nd Ed., 694 ; Fleming, Med. PI. and Drugs, as in As. Res., roda XI., 169; U. S. Dispens., 15th Ed., 1582; Cat. of Med. PL* Printip Durbar, Col. Ind. Exhib., No. 120; Baden Powell, Pb. Pr., 5^ / 474477 Son, Him. Dist., 740; Drury, U. PI., 268 ; Lisboa, U. PI. Bomb, My<sup>2</sup> for Son, Him. Dist., 740; Drury, U. PI., 268 ; Lisboa, U. PI. Bomb, W<sup>2</sup> for Son, Sif, Guide to the Mus. of Ec. Bot., 75; For. Ad. Rep. Ch. Nagpur, n of 34; Ind. For., 1885, V., 211; VI. 240; XI., 5; AgriHort. Socgandia, Trans. II., 168 / Journ. (Old Series), VII., Sel. 56; X., 36; 71, setteers:—Orissa, II., 181; Mysore and Coorg, I., 50; Bombay, ** TS3; XV., Pt. I., 443; NW. P., IV., Ixvvii; Hoshiarpur (Panjab),!*</li> <li>Habitat.—An evergreen shrub, indigenous to America, but cultiyatea in most parts of India, especially on the Coromandel Coast and in Tra-</li> </ul> |
|                  | vancore.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| RESIN.<br>Juice. | Resin.— Dymock writes: "The JUICE when dried in the sun forms, a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>42</b>        | bright reddish-brown, brittle, substance like shell-lac, which may yet oe<br>put to some useful technical purpose." Dr. Warden reports that an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                  | acrid resin has been isolated by Sauberran from the plant. Drury states                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| {                | that "the juice is of a very tenacious nature, and if blown forms large<br>bubbles, probably owing to the presence of caoutchouc."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| DTE.<br>Juice.   | Dye.—" The JUICE dyes linen black " (Liotard)*<br>Oil.—The SEEDS yield about 30 per cent, of an oil of a pale yellow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                  | colour and acrid taste, which is employed by the poorer classes of natives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                  | for illuminating purposes. In England the oil obtained from African seeds<br>at one time obtained a reputation as a lubricant, and is said to be used in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 44               | the manufacture of certain transparent soaps. Of late years, it has also<br>been recommended as a substitute for olive oil in dressing woollen cloths,<br>and as a good drying oil. The Chinese are said to form a varnish by boil-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1                | ing the oil with oxide of iron.<br>Chemical Composition.—Dymock gives the following : " The kernels of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CHEMISTRY.<br>45 | the seeds were found by Arnandon and Ubafdinj to contain 7*2 per cent,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                  | of water, 37*5 of oil, 55*3 of sugar, starch, albumin, casein, and inorganic matters. The kernels yielded 4*8 per cent, ash, and 4*2 per cent, nitrogen;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                  | the kernels and husks together 6 per cent, ash, and 2*9 per cent, nitrogen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                  | The oil yielded by saponification, glycerin and an acid, which, as well as<br>the unsaponified oil, produced octylic alcohol by distillation with hydrate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                  | of potassium." Ricinollic acid, a substance which also occurs in castor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                  | oil, is said to be a constituent of the seeds. This oil may be distinguished<br>from castor oil by its very slight solubility in alcohol.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MEDICINE.        | Medicine.—The seeds, like those of the allied castor oil and croton oil                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Seeas.<br>46     | plants, are purgative, more drastic than the former, and milder than the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                  | latter. They are employed for this purpose by the more indigent classes of natives, but the uncertainty of their action, and the frequently violent symp-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ОН.              | toms following their use, render them unsafe, and consequently little esteemed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 47               | The OIL possesses similar properties, but labours under the same disad-<br>vantage of uncertainty of action. The acrid, emetic, and drastic principle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  | J. 47                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| A Useful Purgative.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>(7</b> . <i>Murray</i> .)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | JATROPHA<br><u>Curcas.</u>                        |
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| appears to reside chiefly in the embryo. It has been s<br>embryo be wholly removed, four or five of the seeds ma<br>gentle and safe purgative. Numerous cases of poisoning<br>entire seeds are, however, on record. The symptoms appear<br>in the mouth and faces, a feeling of distension and pain in<br>nausea, vomiting, violent purging, heat and congestion of<br>delirium, and insensibility, followed by depression before rec<br>antidote is said to be lime-juice. Owing to the uncertainty<br>case of both the seeds and oil, it appears very improbable<br>ever occupy a place as an internal remedy in European um<br>nally applied, however, the oil is held in high esteem as a<br>herpes, chronic rheumatism, and as a cleaning application<br>ulcers. The LEAVES are rubefacient, andja decoction exte<br>saia to excite the secretion of milk. According to Roxb<br>warmed and rubbed with castor-oil are used by the Native<br>tive. The viscid JUICE which flows from the stem on inc<br>reputation as an application to wounds and foul ulcers. It<br>and promotes healing by forming an air-tight film like th<br>collodion. It has been tried in European practice as a ha<br>rently with success. Thus, in a report of an interesting c;<br>Dr. Evers in the <i>Ind. Med. Gazette</i> , March 1875, it is state<br>was injected into a varicose aneurism, with the effect of alm<br>stopping pulsation, while no ill-effects resulted from the of<br>ROOT-BARK is applied externally for rheumatism in Goa<br>part of the plant, mixed with asafcetida and butter-milk, Is,<br>prescribed in cases of dyspepsia and diarrhoea ( <i>Dymock</i> ).<br>SFECIAL OPINIONS.—§ "Milky juice valuable as a styp<br>particulars, vide Ind. Med. Gazette for March 1875, page<br>for closing cuts or abrasions" ( <i>Brigade-Surgeon W. Dy</i><br>"The viscid juice from the tree is applied to inflamed<br>sticks are used as tooth-brushes " ( <i>T. Ruthman, Moodel</i><br><i>Madras Presidency</i> ). "The juice is stated to strength<br>( <i>Assistant Surgeon T. N. Ghose, Meerut</i> ). *« The milky ji<br>toothache. The tender branch is used by the natives to<br>an excellent wash in eczema and indolent ulcers" ( <i>S</i><br><i>M. Houston, Travancore, a</i> | y be used as a<br>from eating the<br>ar to be, burning<br>n the abdomen,<br>the extremities,<br>overy. The best<br>of action in the<br>that either will<br>edicine. Exter-<br>remedy for itch,<br>for wounds and<br>rnally applied is<br>urgh the leaves<br>is as a suppura-<br>ision has a high<br>checks bleeding<br>nat produced by<br>mostatic appa-<br>ase published by<br>d that a drachm<br>tost immediately<br>operation. The<br>a, and the same<br>in the Konkan,<br>otic. For further<br>66'' ( <i>Civil Sur-</i><br>ed like collodion<br><i>mock, Bombay</i> ).<br>gums, and the<br><i>liar, Chingleput</i> ,<br>nen the gums''<br>uice is useful in<br>o clean the teeth<br>the leaves forms<br><i>urgeon-Major J.</i><br><i>Gomes, Travan-</i><br>se vomiting and<br><i>habad</i> ). "The<br>d has been fre-<br><i>eon Nanda Lall</i><br>indolent ulcers<br>5'' ( <i>Surgeon W</i> ,<br>old unhealthy<br>ache and gum- | Leaves.<br>48<br>Juice.<br>49<br>Root-bark.<br>50 |

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| JATROPH              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <u>glandulife</u>    | A Populad Croop Dyo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| DOMESTIC.<br>Si      | Domestic Uses.—This plant is readily propagated by cuttings and is<br>much employed in making hedges. The young twigs are used as deter-<br>gent tooth-cleaners and are supposed to strengthen the gums. They are<br>also said to be employed in making pipe stems. Lisboa states that the<br>young leaves and branches are used in Damaun as a manure for cocoanut<br>trees. Captain Jenkins writes that if castor oil leaves are not procur-<br>able, the leaves of this plant, with others, are used in Assam to feed silk-<br>worms ( <i>Trans. Agri -Hort. Soc. of Ind.</i> , $H_{36\%}$ 168).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 52                   | Jatropha glandulifera, Roxb.; Fl. Br. Ind., V., 382.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | <ul> <li>Syn.—JATROPHA GLAUCA, Vahl.</li> <li>Vem.—Ldl-bherenda, BENG.; Verendi, KOL.; Undarbibi, jangU-erandt*<br/>BOMB.; Addalai, udalai, TAM.; Dundigapu<sub>6</sub>kdti dmudapu, ncla dmw<br/>damuy TEL.; Nikumba, SANS.; Abab (Ainslie, according to Moodeen<br/>Sheriff this name is more properly applied to a plant of the Natural Order<br/>SOLANACE^E, ARAB.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                      | References.—Roxb., Fl. Ind., Ed. C.B.C., 689; Kure, For. Fl. Burnt-,<br>II., 403; Thwaites, En. Ceylon PI., 277; Dale. & Gibs., Bomb. Fl.,229*<br>Elliot, Fl. Andhr., 48, 89; Pkarm Ind., 204; Ainslie, Mat. Itd., H-> Si<br>O'Shaughnessy, Beng. Dispens., 558; Dymock, Mat. Med. W. Ind., 2na<br>Ed., 697,' Liotard, Dyes {App.}, II. Cooke, Oils and OiUee^s, SO;<br>Wardle, Rep. on Dyes and Tans, of Ind. (r88f), 11, 3\$: For. Ad. RfP'*<br>Ch. Nagpur, 1885, 34; AgriHort. Soc. Ind. Journ. (Old Series).<br>XII., Pro. 25, 26, 29, 30; Gazetteers.—Mysore and Coorg, I., 65; Bow<br>bay, XV., Pt. /., 443.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | Habitat.—A shrub or (?) small evergreen tree, common near villages in<br>Bengal, Burma, the Northern Circars, and the Deccan, rare in Oudh and<br>the Panjáb. One of the most abundant of hedge plants in the lower pro-<br>vinces but also prevalent on village waste lands. Distributed to tropical<br>Africa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| RESIN.<br>53<br>dye. | Resin.—Kurz states that this species yields a resin, which appears to<br>have been unnoticed by other writers, and is probably not used.<br>Dye.—One of the most interesting economic features of this plant is the<br>fact .that it is one of those reputed to yield a green dye. The first person to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Leaves.<br>54        | bring this to notice was Dr. Thompson, Civil Surgeon of Malwa, who in<br>1862 submitted to the AgriHort. Soc. of India, specimens of cotton, silk,<br>and wool, which were said to have been dyed green by the. juice of the LEAVBS*<br>From recent investigations, however, it would seem extremely improbable<br>that the beautiful green colour then shown, was obtained without the aid of<br>indigo or some other blue dye. In 1877 samples of the dye were forwarded<br>by the Government of India, to Mr. Wardle. Careful''experiments were<br>made by many processes with silk and cotton, but the colours obtained<br>were all yellow, arab, fawn or brown, with, by one or two of the processes,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Seeds.<br>55         | a faint greenish tint. Mr. Wardle reported as follows :—" In the report<br>of Surgeon-Major G. Bidie, M.B., it is stated that these leaves yield a<br>green dye of great beauty; but none of the methods which the limited<br>quantity of dye-stuff at my disposal has enabled me to apply, have pro-<br>duced any such result, nor do I think it likely that they will produce a<br>green without the aid of indigo or other bluish dye,"<br>Oil.—The SEEDS yield a light straw-coloured fluid oil, similar to castor<br>oil in appearance. According to Lepine it has a sp gr. of 0*963, and solidi-<br>fies at s°C. "For preparing this oil, the seeds should be collected as the<br>capsule begins to split or change colour from green to brown; the latter<br>should then be thrown down on a mat, and covered with another mat, and<br>on a few hours exposure to a bright sun the seeds will have separated from<br>the shell; for if allowed to remain on the shrub till qufte ripe, the c&psule<br>bursts and the seeds are scattered and lost" ( <i>Thompson</i> ). The oil is<br>then obtained in the ordinary way by expression, or <sup>M</sup> by roasting the seeds in<br><b>J-55</b> |

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| The Walnut Tree.(9 Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <u>regia</u>                                                   |
| a perforated earthen vessel, fitted upon another vessel, into which when<br>the whole apparatus is heated in a pit filled with burning cow-dung the oil<br>drops" <i>{Dymock}</i> . It is chiefly used medicinally as an external application.<br>Medicine.—The OIL has long been used as an external stimulating ap-<br>plication in cases of chronic rheumatism and paralytic affections. Like<br>that obtained from J. Curcas it is purgative, but is little employed inter-<br>nally. It is also used as an application to sinuses, ulcers, foul wounds,<br>and ririgworm. Dymock states that the ROOT brayed with water is given<br>to children suffering from abdominal enlargements. It purges, and is said<br>to reduce glandular swellings. The JUICE of the plant is used in various<br>parts of the country as an escharotic to remove films from the eyes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | OIL.<br>MEDICINE.<br>Oil.<br>56<br>Rort.<br>57<br>Juice.<br>58 |
| Jatropha Manihot, <i>Willd.</i> <sup>%</sup> see Manihot utilissima, <i>PohL:</i> EUPHO-<br>[ RBIACEJE.]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 00                                                             |
| <b>J. nana</b> , <i>Dah.</i> &• <i>Gibs. Bomb. fl.</i> 22g; <i>Fl. Br. Ind.</i> , <i>V</i> , <i>382.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>59</b>                                                      |
| Vern.—Kirkundi, MAR.<br>References.—Dymock, Mat. Med. West. Ind., 2nd Ed., 699.<br>Habitat.—A small sparingly branched shrub found rarely in the Konkan,<br>in stony and waste places near Poona, Bombay, &c.<br>Medicine.—The JUICE is employed as a counter-irritant in ophthalmia<br>(Dale. Sf Gibs.).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | MEDICINE.<br>Juice.<br>60                                      |
| Jinjili oil, see Sesamum indicum, <i>Linn. ;</i> PED*LINE,B ; Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                                                              |
| Job's Tears, see Coix lachryma, <i>Linn. 2</i> Vol. II., 492.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                |
| Jonesia Asoka, <i>Roxb.;</i> seeSaracaindica, <i>Linn.:</i> LEGUMINOSA ; Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                |
| JUGLANS, Linn.; Gen. PL, III., 398.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                |
| The typical genus of the Natural Order JUGLANDE^E, comprising <sup>1</sup> three or four species, natives of Asia and North America. Of these one is Indian. AH the species are large, handsome, deciduous, and monoecious trees. The generic name is derived from the old Latin appellation of the walnut <i>Jovisglans</i> or the nut of Jupiter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                |
| Juglans regia, Linn. / Fl Br. Ind., V., S9S / JUGLANDE-E.<br>THE WALNUT TREE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 61                                                             |
| <ul> <li>Syn.—J. REGIA, var. KUMAONICA, COS DC; ? J. ARGUTA, Wall.</li> <li>Vern.—Akhrdt, dkrdt, HIND.; Akhrdt, dkrtit, BENG.; Tagashing, BHUTIA j<br/>Kabsing, ASSAM; Kowal, LEPCHA 5 Ak, dkhor, dkhrot, kharat, NW P.;<br/>Akkor, kharot, KUMAON; Akhor, krot, dtin, KASHMIR; Akhrdt, dun,<br/>chdrmaghz, than than, kh6r, kd, darga, akhdri, krot, ka-botang, starga,<br/>ughg, waghs, thanka, SaasV^dinddsa, PB. J Ugha, waghz, AFG.; 'Akrdda,<br/>MAR.', 'Akhrot, Guz.; Akrdtu, TAM.; Akrdtu, TEL.; Akródu, KAN.;<br/>Siskhyd-si, tikyd-zi, thitkya, BURM.; Yang-gulk, TURKI; Ak&amp;kota dks-<br/>cJidda, dkhdda, dkhota, SANS.; JOUB, ARAB.; Girdagdn,chdr-maghz,<br/>chahdr-maghe, jaoz, PERS.</li> <li>References.—Roxb., FI.Ind., Ed. C.B.C.,670; Brandts', For. FI, 407/<br/>KUVB, For. FI. Burnt., II., 490/ Gamble, Man. Timb., 392; Stewart, Pb.<br/>PL, 201; four, of a Bot. Tour %n Hazard, &amp;c.,in Jour. AgriHort. Soc.<br/>9find., XIV. (Old Series], 12, 45; DC, Origin Cult. PI., 425; Aitchison,<br/>FI. Kuram Valley, in Jour. Linn. Soc, XVIII., 05; Bot. of Ajghan<br/>Del. Com. in Trans. Linn. Soc., III., PI. I. (1888), 110; Voyage of Y.H.<br/>van Linschoten (1506), Ed. Burnell, Tiele. and Yule, II., 279; Mason,<br/>Burma and Its People, 400, 777; Ain-i-Akbari, Gladwin's Trans., I., 83,<br/>65; 11., 143, 169; Ainslie, Mat. Ind., I., 463; O'Shawghnessy, Beng.<br/>Dispens, 60S; Moodeen Sheriff, Supp. Pharm. Ind., 163; U. C. Dutt,<br/>Mat. Med. Hind., 290; Murray, PI. and Drugs, Sind, 36; Year-Book of<br/>Pharm., 1874, 529/ Baden Powell, Pb. Pr., 267, 384, 385,583 i Atkinson,<br/>Him. Dist., 31?, 716, 740; Ec. Prod., NW. P., Pt. V.,88, 89; Cooke,<br/>Oils and Oilseeds, 5'; Spons* Encyclop., 1413; Balfour, Cyclop., II.</li> </ul> |                                                                |

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| CULTIVATION,<br>62<br>d                                                                                                                             | <ul> <li>45'; Smith, Die, 433; Treasury of BoU, /., 641; Kew Off. Guide to the Mus. of Ec. Bot, 140; AgriHort. Soc. Ind. Trans, I., 66; IV., 'OS, 147; VI., 24*; VII. (Pro.)83; Journals {Old Series}, II. (Set.), *9*J IV. (Pro.), 34; V., 1S6 (Sel.), 175-179 {Pro.}, 15, 55; XIII., 37', \$+, 385; Indian Forester, /., 92, 306; VIII., 4*4 / X., 57; XI., 5*, ** XIII., 66, 127; Gazetteers:—Panfab, Peshawar, 28;Bannu,23;<sup>Jera</sup> Ismail Khan, 19; Gurdaspur, 55; Huzara, 14; Rawal-Pindt, '5J Simla, to; Settlement Report, Kohat, 29; Madras Man. of Administr. II., 27.</li> <li>Habitat.—A large deciduous tree found wild and cultivated in the Temperate Himálaya and Western Tibet, from Kashmir and Nubra eastwards at altitudes from 3,000 to 10,000 feet, also in the Manipur and Ava UIISS; distributed to Northern Persia, the Caucasus and Armenia (Fl. Br. Ind.). Aitchison states that it also occurs wild in the ravines of She*ndtoj and Darban in Afghánistán, and DeCandolle considers that it has a wider range of distribution than that described above. According to the latter learned author it has been proved that this tree also occurs wild in Japan, in the nountains of Greece, and in the mountains of Banat, giving a range extending from Eastern Temperate Europe to Japan. This opinion is confirmed by the existence of palaeontological evidence of its having at one time extended as far as Provence.</li> <li>Cultivation.—The use of the walnut and its consequent cultivation late from very remote times; so remote, indeed, that it is impossible to ay at what period the tree was first cultivated in India. For <sup>m*n</sup>, y enturies the nuts have formed an important article of export from the hills o the plains. In the Ain-i-Akban' mention is made of Kashmir wal-</li> </ul> |
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| in<br>of<br>B<br>y<br>w                                                                                                                             | the plants. In the All-t-Akbah mention is made of Kasmin wat-<br>nuts, which, even in the sixteenth century, had a wide reputation, and the<br>nferior "Tartarian'* nuts are also alluded to. At the present day, the<br>ree is extensively cultivated all over the Temperate Himálaya, especially<br>a Afghánistán and Kashmir. It requires a climate with neither extremes<br>f heat nor cold, good soil, and, in the young state, careful weeding-<br>tranch's mentions three varieties:— a tenera, (thin shelled) /3 beluchistanat<br>kamaonia. At Chumba and Kashmir a superior quality is grown,<br>which is characterised by having a soft shell.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| DYE.<br>Bark. ta<br>63<br>Bind. of<br>64<br>OIL. n<br>Kernel. ti<br>95<br>tv<br>ro<br>10<br>p<br>ti<br>ai<br>a<br>a<br>a<br>k<br>w<br>w<br>is<br>th | Dye.—The BARK and RIND of the fruit are used in dyeing and anning.<br>Oil.—The albuminous KERNEL affords, by expression, about 50 per cent, f a clear sweet oil, largely used in the hills for culinary purposes and illumi-<br>tation, but rarely seen in the plains. Stewart states that a large propor-<br>tion of the hill walnut oil is prepared by simply bruising the kernel be-<br>ween stones. It is one of the most important vegetable fixed oils of Eu-<br>ope, and is said to form one-third of the total oil manufactured in France.<br>In Spain and Italy also, outside the olive-growing regions, it is largely ex-<br>ressed. The following description of the mode of preparation, composi-<br>ion, and qualities of the oil may be quoted from $S_{>ons}$ Encyclopaedia:—<br>'The oil should not be extracted from the nuts until two to three months<br>fter they have been gathered* This delay is absolutely necessary to secure<br>n abundant yield, as the fresh kernel contains only a sort of emulsive milk,<br>nd the oil continues to form after the harvest has taken place; if too long<br>period elapse, the oil will be less sweet, and perhaps even rancid. The<br>extends are carefully freed from shell and skin, and crushed into a paste,<br>which is put into bags and submitted to a press; the first oil which escapes<br>termed 'virgin* and is reserved for feeding purposes. The cake is<br>hen rubbed down in boiling water, and pressed anew; the second oil called<br>fire-drawn * is applied to industrial uses. The exhausted cake forms good<br>attle food.<br>"The virgin oil, recently extracted, is fluid, almost colourless, with a                                                                                                                                                                |

| The Walnut Tree.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (J. Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | JUGLANS                                                                                                                                                            |
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| <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <u>regia.</u>                                                                                                                                                      |
| feeble odour, and not disagreeable flavour. Its sp. gr. i<br>and 0-871 at 94°C.; it thickens to a butter-like consistence<br>solidifies to a white mass at $27^{\circ}$ °C. In the fresh state, i<br>in Nassau, Switzerland, and other countries as a substitut<br>salads, &c, but is scarcely to be considered a first class<br>The fire-drawn oil is greenish, caustic, and siccative, surpa<br>in the last respect, and exhibiting the property more str<br>comes more rancid. On this account it is preferred by mar<br>all other oils. It affords a brilliant light, and may be used<br>ture of soft soaps."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | e at—I5°C., and<br>t is largely used<br>te for olive oil in<br>s alimentary oil.<br>assing linseed oil<br>ongly as it be-<br>ny artists before                                                                                                                                                                                                                                                                                                                                            | OIL.                                                                                                                                                               |
| Medicine.—The BARK- is used as an anthelmintic and<br>LEAVES are astringent and tonic, in decoction are suppose<br>in s'.rumous sores, and to be anthelmintic; the FRUIT is a<br>have an alterative effect in rheumatism. The fruit was<br>ancients to be alexipharmic; thus the famous antidote<br>was composed of two walnuts, two figs, and twenty leaves<br>together with a grain of salt. The same belief was held by<br>Food and Fodder.—The FRUIT or "walnut" ripens in ,<br>and consists of two seed-lobes (the edible part) crumpled u<br>shell. Several varieties are met with in the Himálaya.<br>bears a nut with a thick shell and small kernel, which is ra<br>the cultivated varieties the best is a thin-shelled form kno<br><i>akhrot</i> . The walnut forms an important article of diet in<br>the North-West Himálaya, and, as already stated, is exp<br>derable quantities from these localities, also from Afghánis<br>to the plains. The TWIGS and LEAVES are used as fodde<br>larly lopped for this purpose. Stewart states that the inf<br>Sutlej Valley believe that if the trees <u>set</u> a rest in this resp<br>year, the quality of the fruit is not deteriorated. As already<br>the OIL is edible, and the OIL-CAKE a good cattle food.<br>Structure of the Wood.—Heartwood greyish-brow<br>streaks, often beautifully mottled, moderately hard, even-g<br>and polishes well; weight—European 40 to 48ft, Nor<br>laya 4ifb, Sikkim 33ft per cubic foot ( <i>Gamble</i> ). A valua<br>only on account of its useful properties, but also owing to<br>which it can be obtained. Thus Brand is describes trees<br>girth and 100 feet in height from the North-West Himalaya | ed to be specific<br>also believed to<br>believed by the<br>of Mithridates<br>of rice, rubbed<br>y the Arabians.<br>July-September,<br>up within a hard<br>The wild tree<br>arely eaten. Of<br>own as <i>kaghaei</i> -<br>n Kashmir and<br>ported in consi-<br>stan and Persia,<br>er and are regu-<br>habitants of the<br>beet every fourth<br>eady mentioned<br>n with darker<br>grained, seasons<br>th-West Him <b>a</b> -<br>ble timber, not<br>the large size at<br>up to 28 feet in | MEDICINE.<br>Bark.<br>66<br>Leaves.<br>6?<br>Fruits*<br>68<br>FOOD.<br>Fruit.<br>69<br>FODDER.<br>70<br>Twigs.<br>70<br>Twigs.<br>73<br>Oil74 ke.<br>TIMBER.<br>75 |

the tree often reaches a height of 100 to 120 feet with a girth of 12 feet or more. Walnut is at present being grown entirely for the sake of its timber in large plantations at Rangbul and other localities near Darjfling. It is largely used throughout the Himalaya for making furniture, for ornamental, carved, and inlaid work, and as a timber for indoor house-work in European buildings. The wood takes a long time to season, but when thoroughly dry does not shrink nor warp by heat or moisture. This property, together with the fact that it does not corrode iron, renders it most valuable for gun-stocks, in the manufacture of which a large amount of walnut is yearly employed. It is occasionally used for shingles by the Bhutias but is not so good for this purpose as chestnut. At one time a European Company is said to have been formed with the object of purchasing the right to remove the knots from the stems of the walnut trees in Kashmir It is believed this concession was, however, cancelled owing to the reckless injury done to the trees.

Domestic Uses.—" The BARK is largely exported to the plains to be sold under the name of *dinddsa* for women's tooth-sticks, or for chewing to give a red colour to the lips; it is said to prevent the formation of tartar" (*Stewart*). Honigberger states that a twig is recommended to be kept in

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DOMESTIC. Park. **76**  3

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| JUNIPERUS<br>communis                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| DOMESTIC.                                                               | a room to dispel flies. Abul Fazl, in his description of the Subah of Kash<br>mfr, mentions a curious custom which appears to have prevailed in nis u in<br>He writes : "In the village of Zinabul is a spring and basin, into with<br>people throw walnuts, to know what will be the issue of any attair, in<br>walnuts floating is a good omen, and on the contrary if they sink, it is a SIB<br>of bad luck."                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 77                                                                      | JUNCUS, Linn. ; Gen. PL, III, 867.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                         | The typical genus of the Natural Order JUNCACE*; it comprises many Indian<br>species. Ln India none appear to be utilised, but in Europe the common<br>rush, Juncus effusus, <i>Linn.</i> , is employed for making mats, baskets, and<br>chair bottoms, and its pith is used for the wicks of rush-lights. In <b>Spain</b> It<br>is said to be also used in the preparation of a textile fibre. Two other <b>species</b><br>are utilised for paper-making in Australia, and in Italy one affords a <b>cordage</b><br>fibre. It is extremely probable that certain of our Indian <sup>specie*</sup> !!!!*!."<br>be similarly utilised. Thus Royle has suggested that J. glaucus, <i>EhrQ.</i> a<br>common Himalayan rush which is closely allied to J. effusus, <i>Linn.</i> , might<br>be employed for all the uses to which the latter is put in Europe. |
|                                                                         | JUNIPERUS, Linn.; Gen. PI., III., 427-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                         | A genus of evergreen monoecious trees or shrubs belonging to the<br>Natural Order CONIFERJE, and comprising some 25 species, natives ot the<br>temperate and cold regions of the Northern Hemisphere. Of these four are<br>Indian.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 78                                                                      | Juniperus communis, Linn.; FL Br. Ind., V., 646; CONIFER*.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ļ                                                                       | THE JUNIPER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                         | <ul> <li>Syn.—J. NANA, Willd.</li> <li>Vern.—JAaraar, HIND.; Chichia, KUMAON; Núch, páma, pethra, bentha, betar, Jaraar, HIND.; Chichia, KUMAON; Núch, páma, giáshák, betar, KASHMIR; Petthrí, petthar, betthal, wetyar, páma, giáshák, lassar. mieň, chućň., becar, anu, scowar, lassar. mieň, chućn., becar, anu, scowar, lassar. thilu, ^*'l*™i%&amp;t. Chini, shuha, PITI; Sbama, LAHOUL J Abhal, DEC.; ¥ruxt=Abhal, habbul aaraar, samratul-arraar, ARAB.</li> <li>References.—Brandis, For. Fl., 535; Gamble, Mat. Ind I. 37* / *f<sup>N</sup>V*</li> <li>PbPl 222-3; Pharm. Ind., 223; Ainslie, Mat. Ind I. 37* / *f<sup>N</sup>V*</li> <li>Jhnessy Beng.Dispens., 6, Moo'deenSheriff, Sufif. Pharm • Ind. 164, *Dymock, Mat. Med. W. Ind., 2nd Ed., 762 / Fluck. &amp; Hanb., Ph^macog.,</li> </ul>                                               |
|                                                                         | 624; Bent. (3) Linnin,<br>Murray, Pl. and Drugs, Sind, 26; Year Book Pharm., 1874. 14, 65, 629,<br>Murray, Pl. and Drugs, Sind, 26; Year Book Pharm., 1874. 14, 65, 629,<br>Murray, Pl. and Drugs, Sind, 26; Year Book Pr., 378; Atkinson<br>resident Mod. Patna. 38; Baden Powell, Pb. Pr., 378; Atkinson<br>Kim. Dist., 318, 842; Bird wood, Bomb. Pr., 85; <u>Piesse. Art of Perfumery</u><br>363; Spons> Encyclop., 1422, 1624, 1681   Balfour, Cyclop., II, 454<br>Smith, Die, 100, 230; Treasury of Bot., /., 642; Kern Reports, t3i; Ind<br>Far., III., 25,32; VIII., 409; XL, 5/ XIII., 62, 70   AgriHort. Soc<br>Jand Journe Hind, Series, Journe States, 19, 1997<br>Habita t A large shrub of the North-West Himalaya from Kumaon                                                                                                              |
|                                                                         | westwards, at altitudes from 5,500 to 14,000 feet; d»mtatod thimg<br>Asia to Temperate and Sub-arctic Europe, North Africa, and North                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| RESIN.<br>Wood.<br>, <b>79</b><br>Fruit.<br><b>80</b><br>OIL.<br>Fruit. | Am Rc£ta The WOOD is highly resinous, and the ripe FRUIT ^o^conUm a resin—neither are of special economic value. The name of J^T; gum'' or «• resin '' has been erroneously applied to Sandaracn, a proauc of Callitris quadrivalvis. See Vol. II., 28.<br>Oil.—A volatile oil is obtained, to the extent of from 0-4 to 1 2 per cent., by distilling the FRUIT with water. This oil is most abundant in the fully-grown green fruit, since on ripening a certain amount is transformer                                                                                                                                                                                                                                                                                                                                                                   |
| 8i                                                                      | into resin. It is colourless or pale yellow, has a strong odour of the <b>J.81</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| The Juniper. ( <b>7</b> , Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | UNIPERUS                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | communis."                                |
| fruit, a sp. gr. of $0*847$ <sup>to</sup> $0*870$ , and is slightly soluble in alcohol.<br>Chemically it consists of a mixture of levogyre oils, one of which has the<br>composition of C <sub>10</sub> H <sub>16</sub> and boils at $155^{\circ}$ C, the other and prevailing portion<br>of the oil consists of hydrocarbons, polymeric with terpene, C <sub>10</sub> H <sub>16</sub> and<br>boils at 200 <sup>o</sup> C. ( <i>Fliickiger and Hanbury</i> ). Juniper-oil is considerably<br>used in medicine. The WOOD and YOUNG TWIGS also yield a volatile oil<br>which is frequently distilled abroad. It is sometimes substituted for the<br>officina <sup>1</sup> oil in Europe and America, but though cheaper, ii more close-<br>ly resembles Turpentine in its composition and properties ( <i>Bentley and<br/>Trimen</i> ). Piesse states that it is much employed on the continent in<br>the manufacture of Juniper Tar Soap, made by dissolving the oil in a<br>fixed vegetable oil, such as almond or olive oil, or in fine tallow, and<br>adding a weak soda ley. The result is a moderately frm and clear soap, | OIL.<br>Wood.<br>82<br>Young Twigs.<br>83 |
| which possesses the advantage of ready mixibility with water.<br>Medicine.—The FRUIT and the OIL above described are officinal in<br>the Pharmacopoeia of India and Great Britain. The former, commonly<br>called a berry, is in reality a galbulus, and is round, about the size of a<br>pea, and of a deep purplish black colour, covered by a glaucous bloom.<br>In addition to the oil it contains a large quantity of glucose, 33 per cent.<br>(Trommsdorff), 41*9 percent. (Donath), 16 per cent, in the dried fruit<br>(Rielhausen), 1877—also small quantities of albumenoids, formic, acetic,<br>and malic acids, resin, and inorganic substances. In addition to these<br>Donath in 1873 eliminated '37 per cent, of a bitter principle which he                                                                                                                                                                                                                                                                                                                                                                     | MEDICINE.<br>Fruit.<br>84<br>Oil.<br>85   |
| termed Juniperine.<br>When bruised the fruit has an agreeable, aromatic odour, and a warm,<br>somewhat spicy, sweetish, slightly terebinthinate taste. The medicinal<br>properties of the fruit and oil are similar, both possessing carminative,<br>stimulant, and diuretic qualities, their physiological action closely resem-<br>bling that of turpentine. The remote local stimulant action of Juniper on<br>the kidney, however, is more marked, and it further possesses the advan-<br>tage of being neither disagreeable nor dangerously powerful. But it also<br>must be administered with caution, as in large doses it causes strangury<br>and renal inflammation.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           |
| In European practice the oil is employed in doses of 1 to 4 minims,<br>as a diuretic in dropsy not dependent on acute renal disease, <i>i.e.</i> <sub>9</sub> in<br>hepatic and cardiac anasarca, and in some cases of chronic Bright's<br>disease. It has also been employed in mucous discharges, such as<br>gonorrhoea, gleet, and leucorrhoea, and in some cutaneous diseases.<br>The Juniper Tar Soap above described has been considerably used<br>on the continent of Europe as a remedy for skin diseases, its ready                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                           |
| mixibility i» ith water, and the cleanly nature of the application, giving<br>it considerable advantages over terebinthinous ointments.<br>The NUTS are'sold in the bazaVs of Northern India for medicine, and<br>are similarly prescribed as diuretic and stimulant. Irvine mentions that<br>they are imported into Patna from Nepdl, and are used in the treatment<br>of generic process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Nuts.<br><b>86</b>                        |
| of gonorrhoea.<br>Structure of the Wood.—White, moderately hard, fragrant, highly<br>resinous, with a small mass of darker wood near the centre. Weight 33<br>to 34ft per cubic foot. Used for fuel, and burnt as incense ( <i>dhup</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TIMBER.<br>*7<br>DOMESTIC.<br>Wood.       |
| <b>Domestic Uses.</b> —The WOOD, TWIGS, and LEAVES, are used as incense in<br>the Panjdb under the name of <i>dhup</i> ( <i>Stewart</i> ). Madden states that the<br><b>BERRIES</b> are used with barley meal in distilling a spirit, the former being<br>probably only added for the purpose of flavouring the liquor. In Europe<br>as is well known they are extensively employed for the same purpose<br>hi the case of gin.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 88<br>Twigs.<br>Leaves.<br>90<br>Berries. |
| J.91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 91                                        |

| 647.<br>Cat., 6041, (noto/Bieb),<br>Dhúp, padam, padmak<br>ckundun, KUMAON;<br>rbúta, sMrg&, sh&kpa,<br>ble, Man. Timb., 4* <sup>2</sup> .:<br>Hazara, &c, in Agrt<br>; Aitchison, Bo. of<br>I. 1888, n3 ; Baden<br>843; Balfour, Cyclop.,<br>as3, XIV. 267, &?<br>rfo; Hasara, 12/ Ind.<br>VIII, 114; T><br>igab, Simla Dist., 10;<br>of the arid tract of<br>Western Tibet, at<br>anistan, Beluchistin,<br>regarding this tree<br>a synonym wWch<br>looker remarks, "I<br>Sylviculture, in the<br>to this tree by the<br>ernandez writes:-<br>own, grows in India<br>the plant on which<br>he entire tree." In<br>es (the only Indian<br>f., collected by Mr.<br>nat both these state-<br>a mistake has been<br>tes, is highly resini-<br>bears to have similar<br>tHES when burnt are<br>uence, and, in Khd-<br>um of fever.<br>I red, very fragrant,<br>om 25 to 37S per<br>reeable odour as the<br>n not strong, with-<br>Owing to this pro-<br>naking water chan-<br>e exterior walls of |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**J.96** 

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| The Weeping Blue Juniper. (J. Murray!)                                                                                                                                            | UNIPERUS <sub>y</sub><br>recurva. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Domestic and SacredIn the Buddhist regions of the Inner Himálaya                                                                                                                  | DOMESTIC &<br>SACRED.             |
| this Juniper is regarded as sacred. It is frequently planted near temples; the WOOD and TWIGS form part of the incense called <i>dhúp</i> ; the FRUIT is                          |                                   |
| also burned as incense, and the young twigs are used as votive offerings. In                                                                                                      | <sup>W</sup> 97 <sup>d.</sup>     |
| Ladak small BRANCHES are frequently seen placed on cairns, &c. A certain quantity of the wood is said to be exported to the plains for use as incense.                            | Twigs.                            |
| Juniperi's pseudo-sabina, Fisch. & Mey.,- FL Br. Ind., V., 646.                                                                                                                   | Fruit.                            |
| Syn.—JUNIPERUS EXCELSA, Wall., Cat., 6041 (not of Bieb); J. WALLI-                                                                                                                | <b>99</b><br>Branches.            |
| CHIANA, Hook.f. & Thorns.; J. SABINA ? Herb. Ind. Or.; J.INDICA, Ber-                                                                                                             | 100                               |
| toloni.<br>Vern.—Bhil, HIND.; Tckokpo, SIKKIM ; Shir chin, BYANS; Poh, TIBET.                                                                                                     | 101                               |
| <b>References.</b> —Brandts, Far. Fl. <sub>9</sub> 537, Gamble, Man. Timb., 412; Aitchison*                                                                                       |                                   |
| Fl. Kuram Valley in Linn. Soc. Jour., XVIII., 97 ; Balfour, Cyclop., II.,                                                                                                         | Į                                 |
| 4S5; Ind. For., VIII., 410; XI., 5.<br>Habitat — A variable species occurring on the Temperate Himalaya                                                                           |                                   |
| Habitat.—A variable species, occurring on the Temperate Himalaya, from Kashmir to Bhutan and in Western Tibet, at altitudes of 9,000 to                                           |                                   |
| 15,000 feet. In the North-West Himalaya it is found as a bush, while in                                                                                                           |                                   |
| Sikkim it is a tall tree attaining 60 feet in height, with a stout trunk and black thick ramification and foliage.                                                                |                                   |
| Structure of the Wood.—Similar to that of J. macropoda.                                                                                                                           | TIMBER.                           |
| Domestic Uses.—Aitchison writes: "The BARK exfoliates in long fibrous strips, which are collected and employed by the natives for making                                          | 102<br>DOMESTIC.                  |
| pads for carrying their water-jars on, and for other similar purposes."                                                                                                           | Bark.                             |
| J. recurva, Ham.; FL Br. Ind., V., 647.                                                                                                                                           | 1 <b>10</b> 4                     |
| THE WEEPING BLUE JUNIPER.                                                                                                                                                         | i i                               |
| Syn.—JUNIPRRUS SQUAMOSA, <i>Ham.</i><br>VAP squamete <i>Parlet</i> differs from the typical form in being'' a decum                                                               | 1                                 |
| VAR. squamata, <i>Parlat.</i> , differs from the typical form in being" a decumbent or prostrate bush; J. SQUAMATA, <i>Ham.</i> ; J. DENS A, <i>Gurd.</i> ; J. LAM-               |                                   |
| <b>BERTIANA and RIGIDA,</b> <i>Wall.;</i> J. RELIGIOSA, <i>Royle.</i> <b>Vern.</b> — <i>Tupi</i> , NEPAL; <i>Deschu</i> , <i>chakbu</i> , SIKKIM; <i>Bettir, bkeddra, bidel</i> - |                                   |
| f*ani, thelu,pkulu,jhora, guggal, bil, &r&n, agdni, NW. P. j Wetyar,                                                                                                              |                                   |
| J ettar, chuch, theluphulu, PB.; Pama, TIBET.<br><b>References.</b> — Brandis, For. FL, 536 ; Gamble, Man. Timb., 412; Atkinson,                                                  |                                   |
| Him. Dist.y 318, 842; Royle, III. Him. Bot., 350; Balfour, Cyclop., II.,                                                                                                          |                                   |
| 455•> Agri. Hort. Soc. of Ind., Jour, (Old Series), IV, (SeL), 257, 258;<br>VII., 137* 139> 146-155; Gazetteers;—Mysore and Coorg, /., 66;                                        |                                   |
| Panjab, Simla Dist., 10; Ind. For., /., 97; III., 25; V., 466; VII., 127;                                                                                                         |                                   |
| <i>VIII., 409; IX., 321.</i><br>Habitat.—A very variable plant of the Temperate and Alpine Hima-                                                                                  |                                   |
| laya, from 7,500 to 15,000 feet, which as a tree attains a height of 30 feet                                                                                                      |                                   |
| with a straight trunk and pendulous branches, at higher elevations be-                                                                                                            | ļ                                 |
| comes stunted, in alpine or exposed situations even passing into the condi-<br>tion and described as <i>var</i> . squamata: it is distributed to Afghanistan.                     |                                   |
| <b>Resin.</b> —The WOOD contains a large quantity of resin similar to that of                                                                                                     | RESIN.<br>Wood.                   |
| J. communis.<br>Medicine.—Aitchison reports that the SMOKE from the GREEN WOOD                                                                                                    |                                   |
| is known in Kashmir as a powerful emetic, producing long-continued                                                                                                                | MEDIHNE.<br>Smoke.                |
| vomiting.                                                                                                                                                                         | 106                               |
| Structure of the Wood.—Sapwood white, heartwood light red, very fragrant; similar to that of J. excelsa, except that the short broad medul-                                       | TIMBER.                           |
| lary rays are wanting; weight 38 to 42ft per cubic foot. Used for fuel.                                                                                                           | 107<br>DOMESTIC.                  |
| Domestic Uses.—This species, like those already described, is one of the                                                                                                          | Wood.<br>108                      |
| chief sources of incense, the WOOD, LEAVES and TWIGS being exported from Sikkim for this purpose. Atkinson describes an interesting use of the leaves                             | Leaves.                           |
| and twigs in the North-West Provinces Gazetteer, Vol. X., in which he                                                                                                             | 109                               |
| writes: "This bush is used in the manufacture of the yeast called <i>balma</i> ,                                                                                                  |                                   |
| J. no                                                                                                                                                                             | ZZO                               |
|                                                                                                                                                                                   |                                   |

| JUSSIiEA<br>suffruticos      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| DOMESTIC                     | which forms an adjunct in the preparation of spirits from rice. The yeast<br>is made by moistening coarse barley flour, which is formed into a ball<br>and covered all round with leaves and twigs of juniper. The whole is men<br>closely wrapped up in blankets, kept in a warm place, and allowed to<br>ferment, which it usually does in three or four days."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                              | JURINEA, Cass.; Gen. PL, II., 473-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| III                          | Jurineamacrocephala, £**/£./ <i>Fl.Br. Ind.</i> , <i>III., 378;</i> COMPOSITE.<br>Syn.—DoLOMiEA MACROCEPHALA,Z?C.;SERRATULA MACROCEPHALA, Wall.<br>Vem.—Dhúp, KASHMIR; Dhúp, dhiipa, gugal, shangar, root=dh&p, po-<br>kharmul} PB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| MEDICINE.<br>Root.<br>112    | These terms are applied not only to the root of this plant but also to many otner<br>fragrant products used as incense. (See species of <b>Juniper</b> above.)<br><b>References.</b> — Stewart, Pb. PI., 125; Baden Powell, Pb. Pr., Vern. Index,<br>xlix.; Atkinson, Him. Dist., 312; Christy, Com. PI. and Drugs, VI., 93.<br>Habitat.—A herb, with perennial root, common in the Western Hima-<br>laya, from Kashmir to Kumaon, at altitudes from 11,000 to 24,000 feet.<br>Medicine.—"The bruised ROOT is applied to eruptions, and a decoc-<br>tion of it is taken in colic, &c. Aitchison also remarks that some part of<br>the plant is used medicinally. The root is from many places exported to<br>the plains, sometimes after being pounded and made up into cakes with<br>its own juice, as I was informed in Khagan. And it appears to be officinal<br>in the Panjab bazdrs under both of the above names. It is considered cor-<br>dial, and is given in puerperal fever, &c. This is probably <i>the jan</i> (root)<br><i>dhup</i> , of which nearly seven maunds from Bissahir were exposed for sale<br>at the Rampur fair in 1867, according to the Official Report " (Stewart).<br>In confirmation of the above statement of Stewart's it may be men-<br>tioned that Dr. G. Watt saw the preparation <i>dhup</i> being made from the |
| DOMESTIC<br>& SACRED.<br>113 | roots of this plant in Rampur, and also higher up on the neighbouring hills<br>bordering on Kulu witnessed the plant being collected for export to Ram-<br>pur.<br>Domestic and Sacred Uses.—Madden states that the odorous root is<br>used as incense offered at shrines and to rajds. The flowers also are placed<br>in temples on the Sutlej. ( <i>Cf. dhup</i> under Juniperus.) A considerable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                              | quantity of the root is believed to be exported from Kashmir to Tibet for<br>use as incense.<br>JUSSLdEA, Linn.; Gen. PL, I., 788.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 114                          | Jussiza Suffruticosa, Linn.; Fl. Br. Ind., II, 587; ONAGRACE2E.<br>Syn.— J. EXALTATA, Roxb.; J. VILLOSA, Lamk.; J. FRUTICOSA, DC.; J.<br>SCABRA, Willd.; J. BURMANNI and OCTOPHILA, DC. / J. LONGIPES,<br>Griff.;], DECUMBENS, Wall.;) ANGUSTIFOLIA, Lamk.; EPILOBIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                              | <ul> <li>FRUTICOSUM, Lour.</li> <li>Vern.—Lal-bunlunga, bun-lung, BENG.; Petra da, dak ichak, SANTAL.;<br/>Panalavanga, MAR.; Niruagnivendrapdku? (ELLIOT), TEL ; Carambu,<br/>MALAY.; Heemarago, SING.; Bhalava anga, SANS.</li> <li>References.—&amp;&gt;*£., Fl. Ind., Ed. C.B.C., 371; Kurz in Jour. As. Soe.,<br/>1877, Pt. II., 90; Thwaites, En. Ceylon PL, 123; Dais. &amp; Gibs., Bomb.<br/>Fl., 98; Rheede, Hort.Mal., II., t. \$0; W. &amp; A., Prodr., 336; Campbell,<br/>Ec. Prod. Chutia Nagpur, Nos. 8720, 9211; Elliot, Fl. Andhr, 135 /<br/>Ainslie, Mat. Ind., II., 66; Dymock, Mat. Med. W. Ind., 2nd Ed., 325 /<br/>Drury, U. PL, 269; Gazetteers—Bombay, XV., 434; NW. P., /., 80;<br/>W. Ivvii</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                              | <i>IV., Txxii.</i><br>Habitat.—A perennial under shrub, found all over India, in moist places, which are overgrown with small jungle except in the western desert regions; also a native of Ceylon; distributed through the warmer moist parts of the whole world.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                              | J. 114                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| A SUDSLILULE IOF FILDADFA. {J. WINFAV!)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | USTICIA<br>ocumbens.                                             |
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| Medicine.—Ainslie, quoting Rheede, states that the plant, ground<br>fine, and steeped in butter-milk, is considered good in dysentery, and<br>that a decoction is said to dissipate flatulency, increase urine, and to act<br>as a purgative and anthelmintic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MEDICINE,<br>H5                                                  |
| JUSTICIA, Linn.: Gen. PL, IL <sub>9</sub> 110S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                  |
| Justida Adhatoda, Linn. ; see Adhatoda Vasica, Nees. Vol. 1., 109.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                  |
| J. bicalyClllata, Wight.; see Peristrophe bicalyculata, Nees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                  |
| [46\$ ; ACANTHACEJS.<br>J. Gendarussa, Linn.f.; Fl. Br. Ind., IV., 332 ; Wight, Ic, t. 468.<br>Syn.—GENDARUSSA VULGARIS, Nees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1x6                                                              |
| <ul> <li>Vein.— Udi-sanbhdlu, nili-nargandi, HIND.; Jagat-madan, jogmodon%<br/>BENG.; Teo, kala-adulsa, BOMB.; Kdlishanbdli, DEC.; Karu-noch-ehi,<br/>karuppu-noch-chi, TAM.; Nela-vdvili, nalia-noch-chili, nalla-vdvili,<br/>TEL.; KarelakkUgidd, KAN.; Karun-noch-chi, vdtdk-koti, vdtnn-golli,<br/>MALAY.; Bavanet, BURM.; Kalu~varani&amp;g SING.; Nila-nirgundi, krisht-<br/>na-surasa, SANS.; Aslak-asvad, ARAB.; Banj-angashte-siydh, PERS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 43; Kurz, For. Fl. Burnt., II.,<br/>247; Gamble, Man. Timb., 280; Dais. &amp; Gibs., Bomb. Fl. Supp.% 71;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                  |
| <ul> <li>Rheede, Hort. Mai., 11mb., 280, Das. &amp; Glos., Bomb. Pl. Supp., 71, Rheede, Hort. Mai., 1X., t. 42; Pkarm. Ind., 162; Ainslie, Mat. Ind., 1, 67; O'Skaugknessy, Beng. Dispens., 483; Moodeen Sheriff, Supp. Pharm.Ind., 164; Dymock, Mat. Med. W. Ind., 2nd Ed., 592 / S. Arjun, Bomb. Drugs, igggBidie, Cat. Raw Prod., S. India, 37} Rumph., Herb. Amb., IV., t., 28.</li> <li>Habitat.—An evergreen, dense shrub, 2 to 4 feet high ; found in tropical</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                  |
| <ul> <li>Habitat.—An evergreen, dense shrub, 2 to 4 feet high ; found in tropical forests throughout India, from Bengal to Ceylon and Malacca, often an escape from cultivation. C. B. Clarke writes in the <i>Flora of British India</i>, "Distribution, Malaya and China to the Phillipines (?wild). This commonly cultivated plant is considered by Nees and T. Anderson to be wild in various parts of India, but the rarity of the seed renders this doubtful. Colonel Beddome says 'Wild on Mooleyit in Tenasserim.''' Medicine.—The LEAVES and TENDER SHOOTS when rubbed emit a strong but not unpleasant odour; used in decoction in chronic rheumatism (<i>Ainslie</i>). The Malays employ the PLANT as a febrifuge. In Java it is considered to have emetic properties (<i>Pharm Ind.</i>). Dr. Dymock, in his <i>Materia Medica</i>, says that the medicinal properties attributed to this plant by Ainslie and in the <i>Indian Pharmacopoeia</i> do not correspond with those which it actually possesses, and conjectures that it has been confounded with some species of Vitex.</li> </ul> | MEDICINE.<br>Leaves*<br>H7<br>Tender<br>Shoots.<br>US<br>Plants. |
| locally is said to be useful in eczema and an infusion of the leaves is<br>given internally in cephalalgia, hemiplegia, and facial paralysis" (Sur-<br>geon-Major J. M. Houston, Trarancore). "The juice of the fresh leaves<br>is dropped into the ear for earache, and into the corresponding nostril on<br>the side of the head aftected with hemicrania" (Honorary Surgeon P.<br>Kinsley, Chicacole, G an jam, Madras),                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                  |
| <ul> <li>J. procumbens, Linn.; FL Br. Ind, IV., \$39.</li> <li>Syn.—JUSTICIA MICRANTHA, Wall.; J. HIRTELLA, Wall.; ROSTELLULA-<br/>RIA PROCUMBENS, Nees.; R. ADENOSTACHYA, Nees.</li> <li>VAR.—latispica, Clarke; SYN.—ROSTELLULARIA PROCUMBENS, Wight,<br/>Ic, t. ISS9; R- MOLLISSIMA, Nees.</li> <li>Vern.—Ghdti-pitpdprd, pitpdpada, Bo M B.</li> <li>References.— Roxb., FL Ind., Ed. C.B.C., 45; Dale. &amp; Gibs., Bomb. FL<br/>IQ3; Dymock, Mat. Med. W. Ind, 2nd Ed., S91.</li> <li>Habitat.—A herb of South-Western India and Ceylon, extending as<br/>far north as the South Konkan; distributed to Malaya and Australia.</li> <li>J. 120</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                             | ,                                                                |
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| JUTE.                                      | The Chemistry of Jute.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| MEDICINE.<br>Plant.<br>I2X<br>FOOD.<br>122 | <b>Medicine.</b> — <b>Dymock</b> states that the whole PLANT, gathered when in flower, is dried and used as a substitute for Fumaria, the true <i>Pit-papra</i> * which it resembles in having <b>a</b> faintly bitter, disagreeable taste. (See <b>Fumaria</b> , <i>Vol. IIL</i> <sub>s</sub> 454). $m$ , <b>Food.</b> —It is used more or less as an article of food in certain parts 01 Bombay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 123                                        | JUTE. •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CHEMISTRY.<br>124                          | The reader should consult the article Corchorus, Vol. IL> $$34'5^{\Lambda^2'}$<br>Since the date on which that article was written certain new and interest'<br>ing facts have been brought to light, the most important of which is<br>perhaps, the exhaustive chemical study to which the fibre has been sub-<br>jected by Messrs. Cross and Bevan. These chemists published, an the<br><i>Journal of the Chemical Society (1889)</i> , the results of their detailed anap-<br>lysis both of the formation of the fibre and its chemical nature. $^{\Lambda_{nel}}$<br>paper is too elaborate and technical for the present work, but doubless,<br>as their discoveries become better known, practical developments of an<br>industrial nature will be brought to light that may extend the uses 01<br>the fibre. The following brief risumi may, however, be here given :<br>ChemistryJute, the best representative of the group of lignified cel-<br>luloses, in the chemical investigations contained in the paper, is <sup>176</sup> HP ? f <sup>5</sup><br>the type. Although from its nature jute fibre is an aggregate, it $^{\circ}J^{1611''}$ ,<br>notwithstanding, a constancy in composition and properties which denote<br>a chemical individual. The simplest expression of its elementary compo-<br>sition is the empirical formula, C <sub>12</sub> H <sub>18</sub> O <sub>3</sub> (C=47*0, H=6-0, O=47° <sup>5</sup> )<br>whilst its proximate resolution into <i>cellulose</i> (78-80 per cent.) and <i>nen-<br/>cellulose</i> (20-22 per cent.) may be represented by the formula 3 C <sub>6</sub> ''w V?'<br>C <sub>6</sub> H <sub>6</sub> O <sub>3</sub> . This is for the time advanced more as a statistical than a map-<br>lecular expression. The authors, however, proceed to show that the mog<br>a oxidisable constituents of the jute-fibre (non-cellulose) are compounds, op<br>compound, characterised by an atomic ratio approximating to C <sub>6</sub> : «6 ··-<br>. Isot-—the fact that in those reactions of the fibre substance wmen-<br>depend on its alcoholic characteristics (OH groups), i «<br>molecular homogeneity is equally manifest.<br>This second proposition is proved by a series of very elaborate «J « <del>groups</del> , <del>fron</del><br><i>i</i> authors further state that, fron the earliest appearance ot the . |

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Mu                                                                                                                                                                                                                          | rray.)                                                                                                                                                                                                                                                           | JUTE.    |
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| 2. The non-cellul<br>lution of which, by c                                                                                                                                                                                                                                                                                                                | lose is a co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| contains the following                                                                                                                                                                                                                                                                                                                                    | g groups of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| (a) $C_{18} H_{18} O_{10}$<br>to form                                                                                                                                                                                                                                                                                                                     | , ketone tra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| to form                                                                                                                                                                                                                                                                                                                                                   | densation v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| These                                                                                                                                                                                                                                                                                                                                                     | are combine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| 00 2, (1                                                                                                                                                                                                                                                                                                                                                  | b) 6, (c) 5,=                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $C_{76}$ Hgo $O_{2}$                                                                                      | 37•                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | - 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| (3) The ligno-cel<br>on this type. The                                                                                                                                                                                                                                                                                                                    | true woods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| 55 <sup>1</sup> *)                                                                                                                                                                                                                                                                                                                                        | ( <i>'</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| 1887-88 was 8,223,85                                                                                                                                                                                                                                                                                                                                      | 59 cwt but                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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| cord, exceeding thos                                                                                                                                                                                                                                                                                                                                      | se of 1882-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| cord, exceeding thos<br>been 10,553,143 cwt                                                                                                                                                                                                                                                                                                               | se of 1882-8<br>., valued at                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3 by 204,23<br>R7*89»7i.5.                                                                                | 39-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 or                                                                                                                                                                                                                                                                                             | se of 1882-8<br>., valued at<br>f the artic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3 by 204,23<br>R7*89»7i.53<br>le <b>Corchor</b>                                                           | 39-<br><b>us</b> particul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs                                                                                                                                                                                                                                                  | se of 1882-8<br>., valued at<br>f the artic<br>of jute ar<br>b. Barry &                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 by 204,23<br>R7*89»7i.5.<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha                               | 39-<br>us particul<br>ian manufa<br>s been pos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | lars are -gi<br>ctures. Th<br>sible to co                                                                                                                                                                                       | res having<br>iven of the<br>prough the<br>posiderably                                                                                                                                                                                                           |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa                                                                                                                                                                                                                           | tion on the second seco | 3 by 204,23<br>R7*89»7i.53<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha                               | 39-<br>us particul<br>ian manufa<br>s been pos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | lars are -gi<br>ctures. Th<br>sible to co                                                                                                                                                                                       | res having<br>iven of the<br>prough the<br>posiderably                                                                                                                                                                                                           |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs                                                                                                                                                                                                                                                  | tion on the second seco | 3 by 204,23<br>R7*89»7i.53<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha                               | 39-<br>us particul<br>ian manufa<br>s been pos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | lars are -gi<br>ctures. Th<br>sible to co                                                                                                                                                                                       | res having<br>iven of the<br>prough the<br>posiderably                                                                                                                                                                                                           |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa                                                                                                                                                                                                                           | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>. Barry &<br>tion on the<br>down to la                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3 by 204,23<br>R7*89»7i.5<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>se subjects<br>ast year:—  | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | lars are gi<br>ctures. Th<br>sible to co<br>owing table                                                                                                                                                                         | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the                                                                                                                                                                                               |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 of<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u>                                                                                                                                                                                            | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>b. Barry &<br>tion on the<br>down to la                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | 39-<br><b>us</b> particu<br>ian manufa<br>s been pos<br>. The follo<br>1887.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | lars are -gi<br>ctures. Th<br>sible to co<br>owing table                                                                                                                                                                        | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br>1889.                                                                                                                                                                                      |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.                                                                                                                                                                                   | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>ese subjects<br>ast year:  | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | lars are gi<br>ctures. Th<br>sible to co<br>owing table<br>1888.<br>Bags.                                                                                                                                                       | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br>1889.<br>Bags.<br>13,163,000                                                                                                                                                               |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>Burma.<br>Straits                                                                                                                                                              | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | lars are gi<br>ctures. Th<br>sible to co<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600                                                                                                                           | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br>1889.<br>Bags.<br>13,163,000<br>10,536,400                                                                                                                                                 |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast                                                                                                                                           | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346>300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | lars are gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500                                                                                                | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300                                                                                                               |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br>manufacture of bags<br>PORTS.<br>Burma.<br>Straits<br>Bombay                                                                                                                                                           | e of 1882-8<br>., valued at<br>f the artic<br>of jute an<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | lars are gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400                                                                                                             | res having<br>ven of the<br>prough the<br>onsiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400                                                                                                                            |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast                                                                                                                                           | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>b Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346×300<br>33.801,900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | lars are gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500                                                                                                | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br><b>1889.</b><br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300<br>28,057,500                                                                                                          |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,                                                                                              | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>b Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346»300<br>33.801,900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 by 204,23<br>R7*89»7i.53<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>se subjects<br>ast year:  | 39-<br><b>us</b> particulian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400<br>34,658,700                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ars are gi<br>ctures. Th<br>sible to co<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600                                                                                   | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300                                                                                                               |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total                                                                           | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346~300<br>33.801,900<br>82,970,200<br>12,813,800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>se subjects<br>ast year:  | 39-<br><b>us</b> particul<br>ian manufa<br>s been pos<br>. The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400<br>34,658,700                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ars are gi<br>ctures. Th<br>sible to co<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600                                                                                   | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br><b>1889.</b><br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300<br>28,057,500                                                                                                          |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total<br>Australia<br>New Zealand                                               | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346»300<br>33.801,900<br>82,970,200<br>12,813,800<br>3,278,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it ha<br>se subjects<br>ast year:   | <ul> <li>39-</li> <li>39-</li> <li>an manufa s particular manufa s been pos</li> <li>The following for the following for</li></ul> | ars are gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600<br>85*236,800<br>18,278,000<br>3,928,100                                          | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the<br><b>1889.</b><br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300<br>28,057,500<br><b>76,217,600</b><br>13,620,000<br>6,584,100                                                          |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 of<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total<br>Australia<br>New Zealand<br>Cape<br>Egypt                             | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>b Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579,300<br>7,748,000<br>22,494,700<br>8,346»300<br>33.801,900<br>82,970,200<br>12,813,800<br>3,278,500<br>4,726,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>se subjects<br>ast year:  | 39-<br><b>us</b> particulian manufa<br>s been poss<br>The follo<br><b>1887.</b><br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400<br>34,658,700<br>84,661,300<br>39,7 <b>2</b> ,3 <b>00</b><br>2,582,900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ars are gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600<br>85*236,800                                                                     | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300<br>28,057,500<br><b>76,217,600</b><br>13,620,000<br>6,584,100<br>4*284,500<br>4,189,400                       |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total<br>Australia<br>New Zealand<br>Cape<br>Egypt<br>New York                  | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579,300<br>7,748,000<br>22,494,700<br>8,346»300<br>33.801,900<br>82,970,200<br>12,813,800<br>3,278,500<br>1,519,000<br>4,726,500<br>7,714,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>ess subjects<br>ast year: | <ul> <li>39-</li> <li>us particulian manufas been posticulian manufas. The follo</li> <li>1887.</li> <li>Bags.</li> <li>12,981,400</li> <li>11,413,300</li> <li>19,578,500</li> <li>6,029,400</li> <li>34,658,700</li> <li>84,661,300</li> <li>16,373,300</li> <li>39,72,300</li> <li>2,582,900</li> <li>2,582,900</li> <li>2,694,600</li> <li>8,736,800</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | lars are -gi<br>ctures. Th<br>sible to co<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600<br>85*236,800<br>18,278,000<br>3,928,100<br>2,636,100<br>3,135,800<br>6,621,400 | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>28,057,500<br><b>76,217,600</b><br>13,620,000<br>6,584,100<br>4*284,500<br>4,189,400<br>24,244,600                      |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 of<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total<br>Australia<br>New Zealand<br>Cape<br>Egypt                             | e of 1882-8<br>, valued at<br>f the artic<br>of jute an<br>b Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579,300<br>7,748,000<br>22,494,700<br>8,346»300<br>33.801,900<br>82,970,200<br>12,813,800<br>3,278,500<br>4,726,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 by 204,23<br>R7*89»7i.53<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>ese subjects<br>ast year: | 39-<br>us particul<br>ian manufa<br>s been pos<br>The follo<br>1887.<br>Bags.<br>12,981,400<br>11,413,300<br>19,578,500<br>6,029,400<br>34,658,700<br>84,661,300<br>84,661,300<br>16,373,300<br>39,723,000<br>2,582,900<br>2,582,900<br>2,594,600<br>8,736,800<br>24,736,ioo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ars are -gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600<br>85*236,800<br>18,278,000<br>3,928,100<br>2,636,100<br>3,135,800               | res having<br>ven of the<br>prough the<br>posiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>8,699,300<br>28,057,500<br><b>76,217,600</b><br>13,620,000<br>6,584,100<br>4*284,500<br>4,189,400                       |          |
| cord, exceeding thos<br>been 10,553,143 cwt<br>At page 559 o<br>Indian consumption<br>kindness of Messrs<br>amplify the informa<br><u>manufacture of bags</u><br>PORTS.<br>PORTS.<br>Burma.<br>Straits<br>Bombay<br>Coast<br>Up-country and Local<br>Home Consumption,<br>Total<br>Australia<br>New Zealand<br>Cape<br>Egypt<br>New York<br>San Francisco | e of 1882-8<br>, valued at<br>f the artic<br>of jute ar<br>. Barry &<br>tion on the<br>down to la<br>1885.<br>Bags.<br>10,579.300<br>7,748,000<br>22,494,700<br>8,346×300<br>33.801,900<br>82,970,200<br>12,813,800<br>3,278,500<br>1,519,000<br>4,726,500<br>7.714,500<br>9,150,200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3 by 204,23<br>R7*89»7i.52<br>le <b>Corchor</b><br>nd the Ind<br>Co., it has<br>se subjects<br>ast year:  | <ul> <li>39-</li> <li>us particulian manufas been posticulian manufas. The follo</li> <li>1887.</li> <li>Bags.</li> <li>12,981,400</li> <li>11,413,300</li> <li>19,578,500</li> <li>6,029,400</li> <li>34,658,700</li> <li>84,661,300</li> <li>16,373,300</li> <li>39,72,300</li> <li>2,582,900</li> <li>2,582,900</li> <li>2,694,600</li> <li>8,736,800</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ars are -gi<br>ctures. Th<br>sible to cc<br>owing table<br>1888.<br>Bags.<br>14,726,700<br>13,880,600<br>16,926,400<br>7,624,500<br>32,078,600<br>85*236,800<br>3,928,100<br>2,636,100<br>3,135,800<br>6,621,400<br>34,484,900  | res having<br>ven of the<br>nrough the<br>onsiderably<br>gives the<br><b>1889.</b><br>Bags.<br>13,163,000<br>10,536,400<br>15,761,400<br>28,057,500<br><b>76,217,600</b><br>13,620,000<br>6,584,100<br>4*284,500<br>4,189,400<br>24,244,600<br><b>24,547*700</b> |          |

There are now in Bengal (according to Commercial returns) 23 mills, at work furnished with 157,175 spindles and 7,673 looms. The probable

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| JUTE.          | • Trade in Jute.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JUTE.<br>TRADE | Trade in Jute.<br>mumber of operatives employed has been estimated at 62,000 hands.<br><i>[Coni, with Vol. II., 558]</i> . In the article Corchorus the probable con-<br>sumption of Jute by the Bengal mills was assumed to be about 8,571428<br>cwt. The commercial returns, which the writer has now been able to con-<br>sult, give the Bengal consumption at 5,000,000 maunds and the probable<br>value of their productions at R300 lakhs. Mr. J. E. O'Conor ( <i>Statistical</i><br><i>Tables of British India</i> ) shows 24 mills at work in Bengal, one in Madras,<br>and one at Cawnpore, and he gives the amount of Jute worked up by these<br>mills during 1888-89 as 3,769.494 cwt. But in comparing commercial with<br>official returns, it has to be borne in mind that the years do not correspond.<br>It, however, seems probable that the estimate of total production of jute<br>( <i>P</i> -535 <i>P</i> <sup>1+se</sup> article Corchorus of 15,000,000 cwt, per annum is not far<br>from correct, being an under, rather than over, estimate. |
|                | J. 125                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                                                                                                                                                                                                       | A Perfume.                                                                                                                                                                                                                                                                                                                                                                                                               | (G. Watt.)                                                                                                                                                                                 | KiEMPFERIA                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| KiEMPFE                                                                                                                                                                                                               | RIA, Linn.; Gen. Pl                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                            |                                                                           |
| A number of species by<br>but those of economic v<br>Other species are referred<br>(the <i>Pdn-u-phyti</i> of Pegu<br>K. pandurata, <i>Roxb.</i> , is sa<br>medicinal purposes, and R<br>This is very doubtfully a na | elonging to this genus are f<br>value are mainly K. Gala<br>to by writers on Indian bota<br>() and K. parviflora (the<br>aid by Rumphius to be cul<br>Rheede notices it as a med<br>ative of India, but it appear<br>emarks that the roots are use                                                                                                                                                                       | ound in Indian gardens,<br>nga and K. rotunda.<br>uny such as K. Candida<br><i>Kd-mong-ni</i> of Pegu).<br>Itivated for culinary and<br>licine used in dysentery.<br>s to belong to Ceylon |                                                                           |
| Kaempferia angustifol<br>» Vern.—Kanjdn-bur<br>Habitat.—A native of                                                                                                                                                   | ca, mudu-nirhisha, HIND.,                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                            | Z-E. <b>I</b>                                                             |
| Medicine.—Roxburg<br>of this plant as a medicin                                                                                                                                                                       | h remarks that the people                                                                                                                                                                                                                                                                                                                                                                                                | e of Bengal use the RO                                                                                                                                                                     | OTS MEDICINE.<br>Roots.<br>2                                              |
| K. Galanga, <i>Linn</i> .                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                            | 3                                                                         |
| MAL.; Katsjolum,<br>mulika, SANS. It<br>ma Zedoaria, Ro.<br>References.—Roxb<br>566; Kurz, Pegul<br>Cat. Bomb. PL,<br>People, 501, 80<br>232; (yShaughne<br>Pharm. Ind., 165                                          | <i>ila</i> , HIND.; <i>Chandu muld</i> ,<br>TAM.; <i>Kachoram</i> , TKL.; <i>i</i><br><b>is probable some of the ab</b><br><i>scoe</i> ; <b>see Vol. II., 669</b> .<br><i>p., Fl.Ind., Ed. C.B.C., 5</i><br><i>Rep., App. C, xx/Thwaites,</i><br><i>208; Elliot, FL Andhr., 7</i><br><i>4; Jour. AgriHort* Soc.</i><br><i>ssay, Beng. Dispens., 649</i><br><i>; Drury, U. PL, 271</i> .<br><b>bundant plant, met wit</b> | Kha <sup>^</sup> mung, BURM.; Chan<br>ove names refer to Cu<br>En. Ceylon PL, 316; G<br>75; Mason, Burma and<br>Ind., X.,341; Pharm. I<br>; Moodeen Sheriff, Su                            | ulum,<br>adra-<br><b>rcu-</b><br>Cat.,<br>rah.,<br>1 Its<br>Ind.,<br>p p. |
|                                                                                                                                                                                                                       | gh remarks that the T                                                                                                                                                                                                                                                                                                                                                                                                    | UBERS are used in                                                                                                                                                                          | per- PERFUMERY.                                                           |
| fumery. Mason says th                                                                                                                                                                                                 | hat the ROOTS may be o                                                                                                                                                                                                                                                                                                                                                                                                   | often seen attached to                                                                                                                                                                     | the Tubers.                                                               |
| necklaces of Karen fem                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                          | eir perfume. They                                                                                                                                                                          | also 4                                                                    |
| India, the TUBERS of this<br>in Hindu medicine. They<br>aromatic taste. O'Shau<br>specific name, it is not the                                                                                                        | bable that, as implied is, and the next species, a<br>y are agreeably fragrant,<br>ighnesssy justly remarks<br>he source of the true G                                                                                                                                                                                                                                                                                   | are used indiscrimina<br>and of a warm, bitter<br>s : '' Notwithstanding<br>alanga root of the di                                                                                          | rish,<br>g its<br>rug-                                                    |
| shops." Drury quoting<br>powder and mixed with 1<br>Boiled in oil it is externa<br>Food.—The TUBERS<br>leaf, &c), the supply bei<br>alludes to its use as a ma                                                        | honey are griven in cough<br>lly applied to stoppages<br>are said to be eaten as ar<br>ng obtained mainly from                                                                                                                                                                                                                                                                                                           | is and pectoral affection<br>of the nasal organs.<br>In ingredient of <i>pan</i> tfb                                                                                                       | ons.<br>FOOD.                                                             |
| K. rotunda, Linn.; Wi                                                                                                                                                                                                 | ght, Ic, t. 2029.                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                            | 8                                                                         |
| <b>Vern.</b> —Bhui-champ<br>Konda kalava, T<br>ban-touk (or my                                                                                                                                                        | pa, HIND.; Bhuichdmpd, E<br>EL.; Malan-kua (or mounta<br>ae-pd-dpu,k), BURM.; Ya<br>phuchampaca, SANS.; Kur                                                                                                                                                                                                                                                                                                              | <b>ain ginger), MALAÝ. ; <i>M</i><br/>wakenda, loukenda, SI</b>                                                                                                                            | uj.;<br>vaer<br>NG.;                                                      |
| <b>References.</b> —Roxb.<br>327; Voigt, Horr<br>Thwaites, En. C<br>Mag., t. 920; G.                                                                                                                                  | ., FL Ind., Ed. C.B.C.,<br>t. Sub. CaL, S66; Kurz,<br>Ceylon PL, 316; Trimen,<br>rah., Cat. Bomb. PL, 208;K<br>95 ; Mason, Burma and In                                                                                                                                                                                                                                                                                  | Pegu Rep., App. C,<br>Cat. Ceylon PL, 91;<br>Rheede, Hort. Mal.,XL, t                                                                                                                      | Bot.<br>9;                                                                |

**K.** 8

| KALANCH<br><u>—laciniata</u> | The Bhui-champa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | Jones, V., p. 69; Ainslie, Mat. Ind., I., 489, 691; O'Shaughness<br>Beng. Dispens., 650; Moodeen Sheriff, Supp. Pharms. Ind., 165; U.<br>Dutt Mat. Med. Hind. 2014. Dumneck. Mat. Med. W. Ind., 2nd Rd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                              | 785; U.S. Dispens., ISth^Ed^S^;'YearBookPharm.] 1880, 251                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| ł                            | • <i>Hort.Söc.Ind.(OldSeries)</i> <sub>9</sub> <i>X</i> <sub>1</sub> <i>3</i> <sub>4</sub> <i>2</i> .<br>•u ** u ~ elegant stemless plant with large rotund leaves: native of<br>the damp hot regions of India and Burma. Distributed to Ceylon, Java<br>and Cochin China. Often met with in cultivation both on account of it<br>graceful leaves and its sweetly-scented flowers, which appear in the ho                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| medicine.<br>9               | season when the plant is leafless; the perfume of the flowers, as the Sans<br>krit name implies, recalls those of the <i>champdka</i> (Michelia).<br>Medicine.—Roxburgh points out that Woodville was in error whe<br>he supposed this plant to be the source of the Round Zedoary (see Cu<br>cuma Zedoaria, <i>Roxb.</i> ; Vol. II., 669), but this mistake continued to be made                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Plant.<br>10                 | by many subsequent writers. Ai nslie remarks: "It is the Zedoaria rotund<br>ot Baunin and has been well described by Sir William Jones in the fourt<br>Volume of the Asiatic Researches. On the Malabar Coast it is termed Ma<br>angua ;and Rheede informs us(Hort. Mai., 1L, 18) that the whole PLANT<br>fi!ffl <sup>re</sup> . • di!??-° <sup>wd</sup> er! and used in the form of an ointment, has wonder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Root.<br>II<br>Tubers.<br>12 | any coagulated blood or purulent matter that may be within the body; h<br>adds-that the ROOT is a useful medicine in anasarcous swellings." D<br>Dymock writes that in Bombay a powder of the TUBERS" is used as<br>popular local application in mumps ( <i>Galgand</i> ), but as they are generall<br>combined with more active remedies, such as Croton seed, Aconite, and<br>Nux-vomica, it is probable that they do not contribute much to the cure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                              | 1 he substance of the rhizomes and tubers is of a pale straw-colour, ha<br>a bitter, pungent, camphoraceoustaste, much like that of true Zedoary<br>the whole plant is aromatic." In the Gazetteer of the Rewa-Kanta Dis<br>trict it is stated that the roots are stomachic and are also applied to<br>swellings. Thwaites remarks that in Ceylon the root is employed med<br>a 11 y, but he does not state for what purpose. The almost universa<br>peiiet (from one side of India to the other) that the rhizomes are useful<br>in reducing swellings, would suggest the desirability of this subject bein<br>more carefully investigated in the future,<br>in S1 firm of poultice. Promotes suppuration (U. C. Dutt, Civit<br>IdSJrm C Support Compared Support of the super of the support of the support of the support of the super of the support of the super of the s |
| 13                           | <ul> <li>Medical Officer, Serampore.)</li> <li>Kain ^ grass, a name used in Burma for certain grasses which, according to Sir D. Brandis, consist chiefly of the following : -Arundo sp., Phragmites Roxburghii, Saccharum procerum, and S? spontaneum. On this subject a considerable amount of official correspondence took place in 1881, between the Chief Commissioner of Burma and the Government of India. For further information see the respective species of grass named above.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                              | Kaladana, see Ipomcea hederacea, <i>Jacq.:</i> CONVOLVULACKJE, p. 485-<br>Kalamander or Calamander Wood, see Diospyros quaesita<br><i>Thwaites 2</i> EBENACEJE ; Vol. III., 154.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 14                           | KALANCHOE, Adam.; Gen. PL, /., 639.Kalanchoe laciniata, DC.; Fl. Br. Ind.9 II., $_{4i_5}$ ; Wight, Ic, tc $["5#; CRASSULACEA$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ·                            | 2>yn.—K. TERKTIFOLIA, <i>Haw.</i> ; COTYLKDON LACINIATA, <i>Roxb.</i><br>K. 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

MEDICINE.

Leaves.

15

| $(\mathbf{G}$ | Wait.)       | KALANCHOH |
|---------------|--------------|-----------|
| (0.           | <i>mun.)</i> | laciniata |

A Medicinal Herb.

Vern.—J{etn3agar, HIND., BENG.; Zakhmkydt, parna-bij, BOMB.; Mala" kulli, TAM.; Hétnasdgara (=sea of gold), SANS.

*Kuui*, 1AM.; *Hetnasagara* (=sea of gold), SANS. **References.**—*Roxb.*, *Fl. Ind., Ed. C.B.C.*,388; Voigt, Hort. Sub. Cal., 268; Kurz in Jour. As. Soc, 1876, Pt. II., 30g; Thwaites, En. Ceylon *PL*, 129,417; Dais. & Gibs., Bomb. FL, 105; Grah., Cat. Bomb. PL, 8J / W. & A.<sub>9</sub> Prod., 360; Mason, Burma and Its People, 773; Dymock, Mat. Med. W. Ind., 2nd Ed., 360; Pharm. Ind., I., Sgo-Spr; Gazetteer, Mysore & Coorg, /., 61; Honigherger, Thirty-five years in the East, II., 263.

Habitat.-An erect, stout, perennial herb, common throughout the tropical regions of India, especially the Deccan Peninsula, and from Bengal (Behar-Dacca) to Burma, Yunan, Malacca, Java, and Tropical Africa.

Medicine.—Bail Ion (Natural History of Plants, III., 317) remarks of the CRASSu LACEJE that the succulent species owe their cooling properties as topical applications to the quantity of water contained in their fleshy organs. It\*seems probable that most of the large-leaved species might be so used, as, for example, the house-leeks of Europe, but at the same time it is probable that certain of the genera and even species possess special peculiarities. It is on this account that the writer does not follow the example, recently given, by the authors of the *Pharmacofrraphia Indica*, in treating Kalanchoe laciniata, K. spathulata, and Bryophyllum calycinum conjointly. Dr. Dymock, in his Materia Medica of Western India, gave a detailed account of Bryophyllum, and quoted under Kalanchoe a brief sentence said to be derived from Ainslie. It would thus seem that no very good object has been served by assigning the properties of Bryophyllum to the species of Kalanchoe. There is a historic interest, however, in this subject which it seems desirable to point out When Roxburgh wrote his Flora Indica (1820), Bryophyllum was a garden curiosity, which he states had been procured from the Moluccas. At the present day, thousands of square miles of Bengal possess that plant as their most prevalent weed. Every lane around the Botanic Gardens, Calcutta, possesses a rampant growth of Bryophyllum, and throughout the greater part of Bengal this is the case, the plant becoming less abundant as the drier areas are reached, though it is also met with as far north as the Sutlej valley in the Panjdb (20 miles from Simla), also in Bombay, Madras, and Burma. We are told it was brought to India by Lady Clive in 1799 (see Rev. J. Long, Journal Agri.-Hort. Soc. Ind. (Old Series), X., 7), but whether that date is absolutely correct or not, botanists agree in viewing it as an introduced plant. Even supposing it existed in Bengal prior to a foreign introduction, such as that attributed to Lady Clive, it must have been an extremely rare plant indeed, to have escaped Roxburgh's scrutiny of the Flora of the Lower Provinces, and even so recent a writer as Stewart apparently did not know of its existence in the Panjdb. This rapidity of distribution within the past sixty years practically proves, therefore, its exotic nature. U. C Dutt, in his *Hindu Materia Medica*, does not allude to either Bryophyllum or Kalanchoe, and, indeed, everything points to an opinion adverse to the belief that Bryophyllum could have been known to even the most modern of Sanskrit writers. In the Pharmacographia Indica, however, we are told of Kalanchoe and Bryophyllum that they ••are called in Sanskrit Asthibhaksha and Parna-vija or 'leaf-seed,' because their leaves, when placed upon moist ground, take root and produce young plants." Now this application of these Sanskrit names could only be made of Bryophyllum, since none of the Kalanchoes possess the remarkable property exhibited by Bryophyllum of producing budules in the crenatures of the leaves. Dr Moodeen Sheriff gives a series of vernacular pames under Kalanchoe laciniata which, in the present work (Vol. I., 543)i <sup>have</sup> been transferred almost entirely to Bryophyllum. It seemed to

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| KALE.                                             | A reputed Cholera specific.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MEDICINE.                                         | the writer at that time, that these names, together with the others given<br>in the passage cited, were, by modern usage, assigned to <b>Bryophylum</b> <sup>*</sup><br>but it may be added that <b>Kalanchoe laciniata</b> being not only the most<br>abundant and best known species, but the one with the strongest claims<br>to the possession of medicinal properties, is in all probability the plant<br>alluded to by all Muhammadan ana Hindu writers on the Materia M edica<br>of India. On the Himalaya <b>K. spathulata</b> is a fairly plentiful species,<br><b>but</b> it has the reputation of being poisonous, and is, therefore, said to be<br>rarely used as a cooling external application, though special preparations<br>from it are so employed.<br>The medicinal properties given in the <i>Pharmacographia Indica</i> will be<br>found in the first volume of this work under Bryophyllum (/. c), but the<br>sentence said to be derived from Ainslie regarding the leaves of K. laciniata<br>may be here given :—• I can myself speak of their good effects in cleaning<br>ulcers and allayirg inflammation." The authors of the <i>Pharmacographia</i><br>add :—"We have seen decidedly beneficial effects follow their application to<br>contused wounds; swelling and discoloration were prevented, and union of<br>the cut parts took place more rapidly than it does under ordinary treatment.<br>The juice of the leaves is administered in doses of \ to 1 tola (45 to 180<br>grains) with double the quantity of melted butter in diarrhoea, dysentery,<br>and cholera; it is also considered beneficial in lithiasis." The above<br>passage has been quoted as it seems of very considerable interest, but the |
| Juice.<br>16                                      | writer is not quite certain whether or not it applies to <b>K. laciniata</b> or to <b>Bryophyllum calycinum.</b><br>SPECIAL OPINION.—§ "The JUICE is used externally in bruises, sprains, and burns; also to cure superficial ulcers. As a styptic it is used on fre-h <b>cuts and abrasions,</b> " ( <i>Civil Surgeon J</i> <sup><math>\%</math></sup> <i>H. Thornion* B.A., M.B., Monghyr</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                   | Kalanchoe pinnata, Pers., also Cotyledon ihtzophylla, Roxb., and<br>Bryophyllum pinnatum, Kure.\ see Bryophyllum calycinum, Salisb.,<br>Vol. I., 543.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 17                                                | <ul> <li>K. spathulata, DC.; Fl. Br. Ind., II., 414.</li> <li>Syn.—K. VARIANS, Haw.; K. NUDICAULIS, Ham.; K. CRENATA, Oliv.;<br/>K. AC UTI FLORA, Kurz.</li> <li>Vern.—Tatdra, rungru, haiza-ka-patta, PB., HIND.; Patt kudri. bakal<br/>patta, KUMAON.</li> <li>References.— Voigt, Hort. Sub. Cat., 268; Kura in Journ. As. Soc, 1S76,<br/>Pt. II., p. 309; Haw. in Phil. Mag. Lond., N. S., VI., 302, 303; W. &amp;<br/>A., Prodr., 350, Oliv., Fl. Trop. Afr., II., 394/ H- /• &amp; T. in Journ.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| MEDICINE.<br>Leaves.<br><b>x8</b><br>Juice.<br>19 | Linn. Soc, II., 91; Atkinson, Him. Dist., 350, 4?6.<br><b>Habitat.</b> —A succulent perennial of the tropical and subtropical Hima-<br>laya, from Kashmir to Bhutan. Found generally between 1,000 and 4,000<br>feet above the sea, but near Simla it ascends to 6,000 feet; common also in<br>Burma. Distributed to the warm tracts of China and  ava.<br>Medicine.—In Lahore this is reckoned a specific in cholera, and in<br>Kangra the burned LEAVES are applied to abscesses.<br>SPECIAL OPINION.—§" The expressed JUICE of the bitter variety of this<br>species is used in enlarged spleen. It acts as an antiperiodic, tonic, and<br><b>drastic purgative.''</b> ( <i>Civil Surgeon J. H. Thornton, B.A., M.B., Mow</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| FODDER.<br>20                                     | <b>Fodder.</b> —It is poisonous to goats and is not eaten by cattle.<br><b>Kalar</b> , see <b>Reh</b> . Vol. <b>VI</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                   | <ul> <li>Kale, a name applied to certain loose-leaved forms of the cabbage; see Brassica (oleracea) acephala; CRUCIFERJE, Vol. 1., p. 534.</li> <li>K. 20</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Kandelia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                 | (G. Watt.)                                                                                                                                                                                                 | KAOLIN                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <ul> <li>Kale, Indian, a name sometimes given to the country where the leaves are eat AROIDE-E/VOI. II., p. 510.</li> <li>Kale, Sea, a name given to Crambe n Crambe cordifolia, CRUCIFER^E, Vol. II</li> <li>Kamela, see Mallotus philippinensis, Müll</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ten; see Colocasia a<br>naritima: see the In<br>., p. 582.                                                                      | ntiquorum,<br>Idian form                                                                                                                                                                                   |                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                 | V 01. V.                                                                                                                                                                                                   |                                  |
| ' KANDELIA, Wight et Am.;<br>Kandelia Rheedii, W. & A., Fl. Br. In                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                 |                                                                                                                                                                                                            | 21                               |
| Syn.—RHIZOPHORA CANDEL, Linn.<br>Vern.—Guria, BRNG.; Rasunia, rasuria,<br>References.—Voi^t,Hort. Sub. Cat.,<br>For. FL Burnt.,'/., 449; Bed dome, I<br>fig. 6; Gamble, Man. Timb., 176;<br>PL, t. 362; Grah., Cat. Bomb. PL, 66<br>Drury, U. PL, 272; Gazetteer, Ort<br>Forester, VI 124                                                                                                                                                                                                                                                                                                                                                                                                                          | , URIYA ; Tsjeron-kana<br>41; Brandts, For. FL,<br>Fl. Sylv. Anal. Gen., to<br>W. & A., Prodr.,1., 3i0<br>8; Rheede, HorL Mat., | lel, MALAY.<br>218; Kure,<br>10, PL XIII.,<br>2; Hook., Ic.<br>VI., t. 351                                                                                                                                 |                                  |
| <i>Forester, VI., 124.</i><br>Habitat.—An evergreen shrub, or sm<br>shores in the tidal creeks of Bengal, B<br>Distributed to Ceylon and the Malay Isla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Burma, and the Wes                                                                                                              | the muddy tern Coast.                                                                                                                                                                                      |                                  |
| Dye and <b>Tan.</b> —The BARK is used in bably as a mordant. It is said to be empl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Tavoy in dyeing re                                                                                                              |                                                                                                                                                                                                            | DTE ft TA<br>Bark.<br>22         |
| material.<br>Medicine—According to Rheede the<br>or long pepper and rose-water, is said to b<br>Structure of the Wood.—Soft, close-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | be a cure for diabetes                                                                                                          |                                                                                                                                                                                                            | MEDICIN<br>Bark.<br>23<br>TIMBER |
| foot; used only for firewood.<br><b>Kankar.</b> —The concretionary carbonate of nodules on alluvial deposits, see Vol. II.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | lime, which usually                                                                                                             | -                                                                                                                                                                                                          | 24                               |
| KAOLIN ; Mallet, Man. Geo<br>Mr. H. B. Medlicott, late Director of<br>has kindly furnished the following note reg<br>"According to Von Richthopen the<br>China is derived from a fine, hard, greenis<br>quarried in the mountains of King-te-cl<br>('high r'dge'). We are more familiar wit<br>Cornish-stone', a highly felspathic grant<br>decomposition, from which the clay is obta<br>cess is sometimes effected naturally by den<br>ready made. It is only the purest varietie<br>inferior kinds being available for crucib<br>according to the greater or lesser trace of<br>Where crystalline rocks occur, as they do<br>is probably not wanting. The quality<br>tested by adequate practical trial. Promit | blogy, Part IV., 129<br>The Geological Survey<br>garding Kaolin :                                                               | ey of India,<br>ain clay of<br>powdered),<br>d Kao-ling<br>he form of<br>ced state of<br>This pro-<br>by is found<br>Kaolin, the<br>on pottery,<br>ing matter.<br>is material<br>an only be<br>een noticed |                                  |

| LEINHOV<br><u>Hospita</u> | N DAKI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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|                           | The reader is referred for further information to the article <b>Cla</b> Vol. <b>II.</b> , 364-367.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                           | Kapok, see Eriodendron anfractuosum, DC. Vol. III., 258-264.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                           | Kapur-kachri, see Hedychium spicatum, Ham.; p. 207; also Curcun                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                           | [Zedoaria, Roscoe; Vol. II., 67<br>Karyat, kiryat, Creyat, see Andrographis paniculata, Nees; Vol. I.,<br>, [24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                           | Katira Gum, see Sterculia urens, <i>Roxb.;</i> Vol. VI.: also Cochlospermur<br>[ Gossypium, DC; Vol. II., 412-41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                           | Kath, or Catechu, see Acacia Catechu, Willd.; Vol. I., 27-44.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                           | Kauri Pine, see Dammara australis, Lamb.; Vol. III., 18.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                           | Keersal, see Acacia Catechu, Willd.; Vol. I., 35.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                           | Kelp, see Barilla, Vol. I., 399; also Fucus, Vol. III., 451.I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                           | Kelu, kilan, & c, see Ccdrus Ubani var. Deodara, Vol. II., 235.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 26                        | Kerosene, see Petroleum, Vol. V.<br>Khaki, an earthy or clay colour, now largely used to dye the uniform                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                           | founded by Kil, a disciple of Krishna Das. They apply ashes of cowdur<br>to their dress and persons, hence the name of <i>khaki</i> as given to then<br>There are numerous processes for producing this colour—some with dye<br>others with pigments. The following may be mentioned :—<br><i>Allahabad Khaki</i> .—This is produced by boiling myrabolans, gall-nut<br>and sulphate of iron together.<br><i>Oudh Khaki</i> .—This is prepared from the barks of Acacia arabica an<br>Butea frondosa with the extract, Cutch.<br><i>Palanpur {Bombay} Khaki</i> .—Obtained from clay in combination wi<br>sulphate of iron. In Palanpur a good khaki is also prepared with Term<br>nalia belerica.<br>In many parts of the country, such as in Manipur, a natural earth<br>used. The <i>laynung</i> earth of Manipur seems capable of much develo<br>ment, <i>r r</i><br>It is needless to attempt an enumeration of all the Khaki dyes of Indi |
|                           | and the reader is, therefore, referred to the article Dyes (Appendix to th work) for further information; also to Pigments, Vol. V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                           | Kharif, see Crops, Vol. II., 594.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                           | Kidney-bean, see Phaseolus vulgaris, Vol. V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| į                         | Kinka Oil, see Vernonia anthelmintica, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ]                         | <b>Kino,</b> see <b>Butea frondosa</b> , <i>Roxb.;</i> Vol. <b>I., 548</b> , and <b>Pterocarpus Marsupiur</b><br><i>I Roxb. s</i> Vol. <b>V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 27                        | KLEINHOVIA, Linn. / Gen. PI., /., 219.<br>Kleinhovia Hospita, Linn.: Fl. Br. Ind., /., 364.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                           | <b>References</b> Roxb., Fl. Ind., Ed. C.B.C., 50S; Bed dome, Fl. Sylv. And $f_{f_{n}}^{n}iJ^{4s}$ Gamble, Man. Timb., 45; Dais. & Gibs., Bomb. Fl., 23<br>$T''J''*^{Pr}odr-> I.,64,' Lisboa, U. PI. Bomb., 22; AgriHort. Sat. hJf>Z'T'r'-'^{48}i^{8}it?^{ourn}iyL'i4^{\bullet}-$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| ļ                         | the traoitatA handsome tree met with in the Eastern and Wester<br>i-eninsulas of India, and distributed to Malacca, Singapur, Ceylon, Java<br>an avenue tree, especially in Calcutta, Poona, be:<br>K, 27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| The Kokoona Oil. (G. Wa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | tt) KOLA<br>Nut.                                            |
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| Structure of the Wood.—The old timber is stated to be much<br>in Java. No information is available regarding the Indian-grow<br>ber.                                                                                                                                                                                                                                                                                                                                                                                                    | valued <b>TIMBER.</b><br>/n tim- <b>28</b>                  |
| Knol-kohl, Kohl-rabi, or Ole kole.<br>This is the turnip-stemmed cabbage which is every year being<br>extensively cultivated in India. There are two varieties—a purp<br>a green. Firminger says the best seed is obtainable from the C<br>Good Hope. The plants take about six weeks or two months to be<br>for the'' table. They should be transplanted when they have abou<br>or four leaves and on ridges 20 inches apart, the plants being 14<br>inches asunder.<br>The reader is referred to Firminger*s Man. Gard. for India, 13 | le and<br>Cape of<br>ready<br>t three<br>4 to 15<br>7-138 ; |
| your. AgriHort. Soc. Ind. (New Series), V.9 41; Rept. Govt. Bot.<br>Sdharanpur, 1884, 5, tstc, also to Vul. I., 534*                                                                                                                                                                                                                                                                                                                                                                                                                    | Gard.,                                                      |
| KOCHIA, Roth.; Gen. PL, III., 60. [DI<br>Kochia indica, Ft. Br. Ind., V., u; Wight, Ic, t. ijgz; CHE<br>Syn.—K. GRIFFITHII, Bunge; PANDERIA PILOSA, Herb. Ind. Or.,<br>T. in part.                                                                                                                                                                                                                                                                                                                                                      |                                                             |
| Vern.—Kaura ro, bui (bazar name b4i chhoti), PB.<br>Reference.—Stewart, Pb. PI., 179-<br>Habitat.—A herbaceous plant found in North-West India from<br>to the Indus (very abundant), also in the Deccan Peninsula and dist                                                                                                                                                                                                                                                                                                              | n Delhi<br>ributed                                          |
| to Afghanistan.<br>Medicine.—According to Stewart this PLANT is employed medi<br>in the Panjdb.<br>SPECIAL OPINIONS.—§ "Used as a vascular (cardiac) stimul<br>cases of weak and irregular heart, especially when following on f                                                                                                                                                                                                                                                                                                        | lant in 31                                                  |
| (Civil Surgeon F. F. Perry, Jullunder City, Punjab).<br>Fodder.—It is used as a camel fodder, see Vol. II., 60.                                                                                                                                                                                                                                                                                                                                                                                                                         | FODDER.<br><b>32</b>                                        |
| KCELERIA, Pers.; Gen. PL, III, 1183.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                             |
| Kceleria cristata, <i>Pers.;</i> GRAMINE^.<br>Syn.—ARIA CRISTATA, <i>Linn</i> .<br>FodderSee Vol. III., 436.                                                                                                                                                                                                                                                                                                                                                                                                                            | 33                                                          |
| K. phleoides, Pers.; Duthie, Fodder Grasses of Northern India,<br>References.—Stewart, Botanic Tour in Haaara (Jour. AgriHo<br>Ind., XIV. 6).<br>Fodder.—See Vol. II., 423.                                                                                                                                                                                                                                                                                                                                                             |                                                             |
| KOKOONA, Thw.; Gen. PL, I, 362.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                             |
| Kokoona zeylanica, Thwaites; Ft. Br. Ind., I., 6/6; CELASTI<br>Reference? —Beddome, Fl. Sylv., t. 146; Anal. Gen., Ixx; T.<br>En. Ceylon PL, 52; Kew Reports, 3r.<br>Habitat.—A tree with pale-coloured bark found on the banks of s<br>in the Western Peninsula and Ceylon                                                                                                                                                                                                                                                             | hwaites,                                                    |
| in the Western Peninsula and Ceylon.<br>Oil.—Thwaites says that an oil is expressed from the SEEDS, w<br>used for burning in lamps.<br>Medicine.—The inner yellow BARK is employed medicinally. It<br>made into a kind of snuff which excites copious secretion, and is co<br>ed beneficial in headache.                                                                                                                                                                                                                                | is also                                                     |
| Kola Nut, see Cola acuminata, R. Br., Vol. II 500.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                             |

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**K. 37** 

| KYDIÁ<br>calycina.              | Krameria; Kydia Fibre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| J                               | Koot Or Kut, see Saussurea Lappa, <i>CB.C.j</i> Vol. VI.<br>KOUSSO, see Brayera anthelmintica, <i>Kunth.;</i> Vol. I., 534.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                 | <b>KRAMERIA</b> , Linn.; Gen. <b>PI</b> , /., 140.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 38                              | Krameria triandra, 'V?''z <sup>*</sup> ^ <i>Pavon;</i> POLYGALEJE.<br>KRAMERIA; RHATANY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MEDICINE,<br>Root.<br><b>39</b> | Habitat.—A native of Peru and Bolivia.<br>Medicine.—Rhatany ROOT is powerfully astringent and tonic. It has<br>been successfully employed in chronic diarrhoea, in passive or atonic<br>haemorrhages, and locally in leucorrhoea, ophthalmia, &c. ( <i>Pharm. Ind.</i> )»<br>The powder may be used as a dentifrice when mixed with prepared chalk<br>or myrrh. The drug is entirely obtained from foreign sources.                                                                                                                                                                                                                                                                                                                                                                   |
| 40<br>fibre.<br>41              | Kulu.—In the Report on Madras fibres (published in the Selections of the Records of the Madras Government, 1856) mention is made of a strong and useful fibre known as <i>Kulu</i> which is said to be prepared by retting. This may be the fibre of Sterculia ureas, <i>Roxb.</i> , which see, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                 | <b>KYDIA</b> , Roxb.; Gen. PI., /., 203.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 42                              | [ MALVACE#.<br>[ Kydia calydna, Roxb./Fl. Br. Ind., /., 348; Wight, Ic, t. 879-80-81;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                 | Syn.—K. FRATERNA, <i>Roxb.</i> ; K. ROXBURGHIANA, <i>Wight</i> ; K. PULVERU-<br>LENTA, <i>Ham.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                 | <ul> <li>Varanga,vdrangada,warung, BOMB.; Baranga, bhofi, C. P.; Bittia, gonyer, pata dhamin, KOL.; Poska 0/al', SANTAL; Derki, KHARWAR; Puta, puttiya, NW. P.; Kubinde, NEPAL; Sedangtaglar, LEPCHA; Mahow, moshun^on, MECHI; Boldobak, GARO; Kopdsia, URIYA; Puth, paid, pold, PB.; Potari, pandiki, peddapotri, pedda kunj't, TEL.; Buruk, bosha, kunji, GOND.; Bendi, bende-naru, bellaka, KAN.; WarungoiXiya, MAR.; Dwabote, bokemaiea, BURM.; Dwabok, SHAN.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 521; Voigt, Hort. Sub. Cal.» 108; Kut9, For. Fl. Burm., 124; Bed dome, Fl. Sylv., t. 3 f Gamble, Man&gt; Timb., 43; Dale. &amp; Gibs., Bomb. Fl., 24; Stewart, Pb. PL, 25; Rev* A'</li> </ul>                                                                     |
|                                 | Campbell, Rept. Econ. Prod. Chutia Nagpur, No. p2/J; Elliot, Fl. Andhr*»<br>144,156; Mason, Burma and Its People, SJ6, 755; O'Shaughnessy, Beng*<br>Dispense 227; Pharmacog. Indica, 228; Atkinson, Him. Dist., 306, 740,<br>•JQI; Lisboa, U. PI. Bomb., 16, 229; Royle, Prod. Res., 230; Fib. PL, 266;<br>Report on Fibres of India by Cross, Bevan, King & Watt, 10 f For. Ad.<br>Rep. Chutia Nagpur, 1885, <sup>2</sup> (Gazetteers:—Burm., I., 130; Bomb., XV.,<br>71; XI., 24; Mysore & Coorgl., 68; Indian Forester, I., 84, 275; II., 18<br>///., 200; IV., 323; VIII., U9» 4*7; X., 222, 325; XI., 38i; XIII., 119;<br>XIV., 269, 2Q8; AgriHort. Soc. Ind., Tram., VII., 81; Jour. {Old                                                                                       |
|                                 | Series), VIII., (Sel.) 177 ; IX., {Set.) 40; XIII., 30S, (Sel.) 60.<br>Habitat.—A small tree, or large bush common in the forests of the<br>sub-tropical regions of India and Burma except the arid tracts. It ascends<br>the Himalaya to altitudes of about 2,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FIBRE.<br>Bark.<br>43           | Fibre.—The inner BARK yields a bast fibre used for coarse ropes, &c.<br>It was chemically analysed by Cross, Bevan and King, and found to pos-<br>sess moisture 10*9; ash 2*5. The decomposition (hydrolysis), by alkalis, gave<br>the following results : loss after boiling for five minutes in solution of 1 per<br>cent. N^O, 13*2, after boiling for one hour, 25*2. Amount of cellulose<br>70*2. Effect of mercerising <i>[i.e.,</i> subjection to action of strong caustic soda<br>(33 per cent. Na <sub>2</sub> O) in cold for one hour] loss 7*2. It will thus be seen<br>that in point of cellulose, and in power of resistance to hydrolysis, Kydis,<br>fibre is fairly useful, being about twentieth in order of merit of a list of<br>some 300 fibres met with in India. |

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к. 43

| The Nirvishá.       IC. With.       KYLLINGA<br>menecephala         Medicine.       —The Rev. A. Campbell tells us that among the Santals the<br>pains. They are also chewed when there is a deficiency of saliva. The<br>chemistry of this plant has not been carefully worked out, but it seems pro-<br>bable (from the properties assigned to it) that it much resembles the<br>mallows.       MEDICINE<br>Leaves.         Food.       —The RARK is mucilaginous, and is used to clarify sugar. The<br>knowledge of this apalication of the bark seems very general on the lower<br>himalaya. Stewart in his admirable report on Bijnour says: "In the<br>manufacture of sugar, the juice of the cane is heated to a less degree than<br>when goor is to be made, and by the addition of a cold infusion of chukha<br>(the bark of Kydia calycina, and sajji, or impure carbonate of soda) it be-<br>comes rdb (syrup). Into this is put a quantity of sarwdli (a Potamageton),<br>also more sajji, and by degrees khand, coarse sugar, to be afterwards<br>(darified by foiling into boora, chinis, misri, &c. crystallizes, and shird<br>passes off."       TIMER.         Structure of the Wood.       —White, soft, no heart-wood. Weight 40 to 45ft<br>a enbic foot. Used for house-building, ploughs, and oars, and for carving.<br>In the forests of Pegu.—it is stated that the saplings are used, from<br>their great strength and elasticity, by the natives, for making banghy<br>sticks, but it is large comployed for making ploughs and spoons."       TIMER.         KYLLLINGA (or KYLLINYIA), Rotth.; Gen. PL, HL, 1045.<br>Several species belonging to this genus are mentioned by various writers as<br>constituting a feature of the pasturage of certain tracts of country. The fol-<br>lowing is the most important species, since, in addition to being eaten by cattle.       47         KylLLINGA (our KYLLINYIA),                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                             | <i>oj</i> =                                                                                                                    |                                                                                                                                                    |                                                                                 | •      |
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| LEAVES are pounded and made into a paste and applied to the body for<br>pains. They are also chewed when there is a deficiency of saliva. The<br>chemistry of this plant has not been carefully worked out, but it seems pro-<br>bable (from the properties assigned to it) that it much resembles the<br>mallows.<br>Food.—The BARK is mucilaginous, and is used to clarify sugar. The<br>knowledge of this application of the bark seems very general on the lower<br>Himalaya. Stewart in his admirable report on Bijnour says: "In the<br>manufacture of sugar, the juice of the cane is heated to a less degree than<br>when goor is to be made, and by the addition of a cold infusion of <i>chukha</i><br>(the bark of Kydia calycina, and <i>saji</i> , or impure carbonate of soda) It be-<br>comes <i>rdb</i> (syrup). Into this is put a quantity of <i>sarvdli</i> (a Potamageton),<br>also more <i>saji</i> , and by degrees <i>khand</i> , coarse sugar, to be afterwards<br>d'arified by foiling into <i>boora</i> , <i>chini<sub>%</sub> misri</i> , &c, crystallizes, and <i>shird</i><br>passes off."<br>Structure of the Wood.—White, soft, no heart-wood. Weight 40 to 45ft<br>a cubic foot. Used for house-building, ploughs, and oars, and for carving.<br>In the Records of the Government—No. IX., A Report on the principal trees<br>found in the forests of Pegu—it is stated that the saplings are used, from<br>their great strength and elasticity, by the natives, for making banghy<br>sticks, but it is large enough to afford timber of three or four feet girth.<br>Dr. Stewart, in his Report on the Forests of Bijnour, says : "The wood is<br>little used, but it is occasionally employed for making ploughs and spoons."<br><b>KYLLINGA (or KYLLINYIA)</b> , <i>Rottb.; Gen. PL, HI.</i> , 1045.<br>Several species belonging to this genus are mentioned by various writers as<br>constituting a fature of the pasturage of certain tracts of country. The fol-<br>lowing is the most important species, since, in addition to being eaten by cattle,<br>its roots are medicinal.<br><b>Syllinga monocephala</b> , <i>Linn.</i> , - CYPERACEJE.<br><b>Yern</b> — <i>Shwet-gotklbi</i> , <i>nirbiski</i> , BENG. and HIND.; <i>Nirvishd</i> , SANS.<br><b>References</b> .— <i>Roxb.</i> , <i>Ft</i> . <i>Ind.</i> , | The N                                                                                                                                                                                                                                                                                                                       | irvishá.                                                                                                                       | ir. Wn»<br>(G. Watt.)                                                                                                                              |                                                                                 |        |
| <ul> <li>Food.—The BARK is mucilaginous, and is used to clarify sugar. The knowledge of this application of the bark seems very general on the lower Himalaya. Stewart in his admirable report on Bijnour says: "In the manufacture of sugar, the juice of the cane is heated to a less degree than when goor is to be made, and by the addition of a cold infusion of chukha (the bark of Kydia calycina, and sajji, or impure carbonate of soda) It becomes rdb (syrup). Into this is put a quantity of sarwdli (a Potamageton), also more sajji, and by degrees khdnd, coarse sugar, to be afterwards d'arified by foiling into boora, chini% misri, &amp;c, crystallizes, and shird passes off."</li> <li>Structure of the Wood.—White, soft, no heart-wood. Weight 40 to 45ft a cubic foot. Used for house-building, ploughs, and oars, and for carving. In the Records of the Government—No. IX., A Report on the principal trees found in the forests of Pegu—it is stated that the saplings are used, from their great strength and elasticity, by the natives, for making banghy sticks, but it is large enough to afford timber of three or four feet girth. Dr. Stewart, in his Report on the Forests of Bijnour, says : " The wood is little used, but it is occasionally employed for making ploughs and spoons."</li> <li>KYLLINGA (or KYLLINYIA), Rottb.; Gen. PL, HI., 1045. Several species belonging to this genus are mentioned by various writers as constituting a feature of the pasturage of certain tracts of country. The following is the most important species, since, in addition to being eaten by cattle, its roots are medicinal.</li> <li>Kyllinga monocephala, Linn.,- CYPERACEE.</li> <li>Vern.—Shwet-gotkdbi, nirbiski, BENG, and HIND.; Nirvishd. SANS. References.—Roxb., Pt. Ind., Ed. C.B.C., Or; Voigt, Hort. Sub. Cal., 724; Wight, Contrib., 0', Dymock, Mat. Med., W. Ind., 2: Jour. Agri. Hort. Soc. Ind. (Old Series), X., 356.</li> <li>Habitat.—A creeping sedge met with throughout the Peninsula of India in low shady pasture ground.</li> <li>Medi</li></ul>                                                                                                                                                                                                                                            | LEAVES are pounded and made into<br>pains. They are also chewed when<br>chemistry of this plant has not been of<br>bable (from the properties assigne                                                                                                                                                                       | a paste and<br>there is a de<br>carefully worl                                                                                 | applied to the be<br>eficiency of saliva<br>ked out, but it seen                                                                                   | ody for body for body<br>. The body<br>ns pro- body                             | eaves. |
| <ul> <li>Structure of the Wood.—White, soft, no heart-wood. Weight 40 to 45ft a cubic foot. Used for house-building, ploughs, and oars, and for carving. In the Records of the Government—No. IX., A Report on the principal trees found in the forests of Pegu—it is stated that the saplings are used, from their great strength and elasticity, by the natives, for making banghy sticks, but it is large enough to afford timber of three or four feet girth. Dr. Stewart, in his Report on the Forests of Bijnour, says : "The wood is little used, but it is occasionally employed for making ploughs and spoons."</li> <li>KYLLINGA (or KYLLINYIA), Rottb.; Gen. PL, HI., 1045. Several species belonging to this genus are mentioned by various writers as constituting a feature of the pasturage of certain tracts of country. The following is the most important species, since, in addition to being eaten by cattle, its roots are medicinal.</li> <li>Kyllinga monocephala, Linn.,- CYPERACEJE.</li> <li>Vern.—Shwet-gotkubi, nirbiski, BENG. and HIND.; Nirvishd, SANS. References.—Roxb., Ft. Ind., Ed. C.B.C., 6r; Voigt, Hort. Sub. Cal., 724; Wight, Contrib., 0/; Dymock, Mat. Med. W. Ind., 2nd Ed., SS3; Dale. &amp; Gils., Bomb. FL, 28s; U. C. Dutt, Hindu Mat. Med., 3u; Jour. Agri. Hort. Soc. Ind. {Old Series}, X., 356.</li> <li>Habitat.—A creeping sedge met with throughout the Peninsula of India in low shady pasture ground.</li> <li>Medicine.—This is believed by many authors to be the Nirvishd of certain Sanskrit medical writers, who recommend the use of the ROOTS as an antidote to poisons. The roots are fragrant and aromatic. (Conf. with 40</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | knowledge of this application of the<br>Himalaya. Stewart in his admirable<br>manufacture of sugar, the juice of the<br>when goor is to be made, and by the<br>(the bark of Kydia calycina, and saj<br>comes rdb (syrup). Into this is put a<br>also more sajji, and by degrees kh<br>clarified by foiling into boora, chin | bark seems v<br>le report on<br>a cane is hea<br>addition of s<br><i>ji, or</i> impure<br>a quantity of<br><i>dnd</i> , coarse | very general on the<br>Bijnour says: '<br>ated to a less degr<br>a cold infusion of<br>carbonate of soda<br>sarwdli (a Potama<br>sugar, to be afte | e lower<br>In the<br>ee than<br><i>chukha</i><br>) it be-<br>geton),<br>erwards |        |
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| <ul> <li>Vern.—Shwet-gotkubi, nirbiski, BENG. and HIND.; Nirvishd, SANS.</li> <li>References.—Roxb., Ft. Ind., Ed. C.B.C., 6r; Voigt, Hort. Sub. Cal., 724;<br/>Wight, Contrib., 0/; Dymock, Mat. Med. W. Ind., 2nd Ed., SS3; Dale.<br/>&amp; Gils., Bomb. FL, 28s; U. C. Dutt, Hindu Mat. Med., 3u; Jour. Agri<br/>Hort. Soc. Ind. (Old Series), X., 356.</li> <li>Habitat.—A creeping sedge met with throughout the Peninsula of India<br/>in low shady pasture ground.<br/>Medicine.—This is believed by many authors to be the Nirvishd of cer-<br/>tain Sanskrit medical writers, who recommend the use of the ROOTS as an<br/>antidote to poisons. The roots are fragrant and aromatic. (Conf. with</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | constituting a feature of the pasturage lowing is the most important species, sin                                                                                                                                                                                                                                           | of certain trac                                                                                                                | ts of country. The                                                                                                                                 | fol-                                                                            |        |
| References.—Roxb., Ft. Ind., Ed. C.B.C., 6r; Voigt, Hort. Sub. Cal., 724;<br>Wight, Contrib., 0/; Dymock, Mat. Med. W. Ind., 2nd Ed., SS3; Dale.<br>& Gils., Bomb. FL, 28s; U. C. Dutt, Hindu Mat. Med., 3u; Jour. Agri<br>Hort. Soc. Ind. {Old Series}, X., 356.Medicitat.—A creeping sedge met with throughout the Peninsula of India<br>in low shady pasture ground.<br>Medicine.—This is believed by many authors to be the Nîrvishd of cer-<br>tain Sanskrit medical writers, who recommend the use of the ROOTS as an<br>antidote to poisons. The roots are fragrant and aromatic. (Conf. withMEDICINE<br>Boots.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Xyllinga monocephala,</b> <i>Linn.</i> ,-                                                                                                                                                                                                                                                                                | CYPERACEJE                                                                                                                     |                                                                                                                                                    |                                                                                 | 47     |
| Habitat.—A creeping sedge met with throughout the Peninsula of India<br>in low shady pasture ground.<br>Medicine.—This is believed by many authors to be the <i>Nirvishd</i> of cer-<br>tain Sanskrit medical writers, who recommend the use of the ROOTS as an<br>antidote to poisons. The roots are fragrant and aromatic. (Conf. with<br>48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | References.—Roxb., Ft. Ind., E<br>Wight, Contrib., 0/; Dymock,<br>& Gils., Bomb. FL, 28s; U. C                                                                                                                                                                                                                              | 'd. C.B.C., 6r ;<br>Mat. Med. W.<br>C. Dutt, Hindu                                                                             | Voigt, Hort. Sub. C<br>Ind. <sub>%</sub> 2nd Ed., SS3                                                                                              | al., 724;<br>; Dale.                                                            |        |
| Medicine.—This is believed by many authors to be the <i>Nirvishd</i> of cer-<br>tain Sanskrit medical writers, who recommend the use of the ROOTS as an<br>antidote to poisons. The roots are fragrant and aromatic. (Conf. with 48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Habitat.—A creeping sedge met                                                                                                                                                                                                                                                                                               |                                                                                                                                | out the Peninsula o                                                                                                                                | of India                                                                        |        |
| ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Medicine.—This is believed by m<br>tain Sanskrit medical writers, who re<br>antidote to poisons. The roots are                                                                                                                                                                                                              | commend th                                                                                                                     | e use of the ROOT                                                                                                                                  | Sasan <sup>I</sup>                                                              | Boots. |
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| LAC.                   | Distribution of Lac in India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| _                      | <b>LAC.</b><br>The name " lac " is applied to the resinous incrustation formed on the bark<br>of twigs of certain trees, by the action of the lac-insect, COCCUS lacca. For a<br>description of the method of production, of the trees on which the insect feeds<br>and produces the incrustation, and of the different forms of commercial lac, the<br>reader is referred to the article under the name of the insect, Vol. II., 409–4 <sup>12</sup> «<br>In this place the distribution of lac in India, its utilisation in Native and Eur-<br>opean industries, and the extent of the lac-trade, will be considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| I                      | Lac.<br>Vern.— Ldkh, HIND.; Gdld, BENG.; rough la.c=Khdmldkk, seSd-Iac:<br>Idkh ddnd, she\\-\a.c=chapra ldkh, \a.c-dye=kirmai, PB.; Ldk <sub>9</sub> Gvz.<br>Komburrukiy TAM.; Kommolaka, TEL.; Arakku, ambalu, MALAY.<br>Khejijk, BURM.; Lakada, SING.; Ldkshd, SANS.<br>References.—Stewart, Pb. PI., 41, 43, 60, 2i3, 214; J. H. van Lins<br>choten, Voyage to the E. Indies, ed. Burnett, Tiele, and Yule, 1885, II.<br>88; Ain-i-Akbari, Blochmann's Trans., 226; U. C. Dutt, Mat. Mba<br>Hind., 276; Fleming, Med. PL and Drugs, as in As. Res., Vol. XL<br>195: Honjaberger Thirty-five years in the East II 286; Baden Powel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ISTRI-<br>UTION.<br>2  | <ul> <li>195; Honigberger, Thirty-five years in the East, II., 2\$6; Baden Powell, Pb. Pr., 190, 194; Pb. Manuf,, 242; McCann, Dyes and Tans, Beng 50-65; Buck, Dyes and Tans, NW. P., 24, 25; Liotard, Dyes, 33–41; Royle, Prod. Res., 4; O' Conor, Note on Lac, 1876; Annual Review of the Trade of India; Trade Statistics of Br. Ind.; J. L. Kipling, Not on Japanese and Indian Processes of lacquering; Balfour, Cyclop, II 246; Ure, Die. Indus., Arts and Manuf,,11,, 78\$; Indian Forester:-I., 269; IL, 292; VIII., 81; IX., 163; AgriHort. Soc. of Ind., Trans:-I., 209; III., 292; VIII., 81; IX., 163; AgriHort. Soc. of Ind., Trans:-I., 209; III., 200; III., 67, 67; VI., 272, 57; V. (Pro.), 34, 40, 49; V<sup>1,2</sup></li> <li>157; VII. (Pro.), 190; VIII. (Pro.), 345, 406; Journals (Old Series):-I., 102; II., 20-233, 252; VII., 263; X., 50-53, (Pro.) 108, us., i85 XI., 45-54; (Sel.), 37-45; XII., 110; (New Series):-I., 179; VI. (Pro.), 6; Bomb. Admin. Rep., 1871-72, 378; Gazetteers:-Panjdb, Peshawar 152, 153; Hoshiarpur, 116; Gurddspur, 60; Lahore, 101; Dera Ghda Khan, 90; Delhi, 129; Montgomery, 140; Bombay, XVI., 180; Mysor, and Coorg, I., 436; C. P. (1870), 118; Madras Man. of Admin., I., 314 Settle. Rep.:-C. P., Upper Godaveri Dist., 40; Chand a Dtst., in. DistributionThe following summary of the occurrence of lac in India is given by Mr. J. E. O'Conor in the note above cited : "In India lad occurs in Bengal and Assam (abundantly), the North-West Provinces and Oudh (sparingly), the Central Provinces (abundantly), the Panjab, Bom bay, Sind, and Madras (more or less sparingly), ana Burma (abundantly in some places). Lac is also found in some other countries of Southerr Asia, viz., Siam, Ceylon, some of the islands of the Eastern Archipelago and China, Siamese lac being held in high estimation. In India the best Uu is obtained from Assam and Burma." Lac from the last mentionee locality would appear to have been long known and esteemed. Thus in the sisteenth century it was noticed and described by the traveller Linschot</li></ul> |
| ngal and<br>ssam.<br>3 | above enumerated, is chiefly consumed in local manufactures.<br>The following more detailed account of the distribution of lac in the<br>various Provinces is condensed from Mr. O'Conor's valuable report:—<br><i>Bengal and Assam.</i> —In Bengal, lac is produced abundantly in the jungle<br>tracts of Birbhum, Chutia Nagpur, and Orissa. In various places in the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Distribution of Lac in India. {J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | LAC.                                       |
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| forests of Assam, it is also found in large quantities and forms a regular<br>article of trade, a portion of the production being manufactured at Dacca,<br>and the rest sent to Calcutta. In 1867 the Deputy Commissioner of Púrúlia<br>in C'hútia Nagpur reported that the smallest average yearly supply from the<br>district was 15,000 maunds, though the actual yield was, he believed, consi-<br>derably more, while it was capable of great extension. From Singhbhúm,<br>at the same period, about 1,250 maunds of lac were exported annually. In<br>the Gya district the supply was estimated at 12,000 maunds; in Kamrup<br>(Assam) about 5,000 maunds. Mr. O'Conor, however, remarks that these<br>figures probably do not by any means approximate to the actual yield of<br>the districts named.<br>In Bengal, lac is gathered twice a year, <i>viz.</i> , from about the middle of<br>October to the end of January, and from the middle of May to the middle<br>of July. | DISTRI-<br>BUTION.<br>Bengal and<br>Assam* |
| <i>The North-West Provinces</i> ,—Lac is obtained in some quantities from<br>the Garhwal forests, and is said to have been largely exported to the plains<br>some years ago. Mr. O'Conor, however, considers it probable that most<br>of the substance thus brought down from Garhwal is consumed in the<br>Province, very little, if any, being sent to Calcutta.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NW. Prov<br>inces.<br>4                    |
| Oudh.~La.c is gathered in the more wooded parts of the south-eastern districts, and is exported to the Mirzapore factories and elsewhere.<br>The Punjdb.—Baden Powell states that the production of lac is universal in this Province. According to Mr. O'Conor, however, Panjab lac is inferior in quality, and is probably not exported, the whole production being consumed locally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Oudh*<br>5<br>Panjab*<br>6                 |
| Sindm—Lac is, in Sind, found only in the forests about Hyderabad, 12 miles north and south of the town. It occurs on Acacia arabica, a tree which, in moister regions, appears to be exempt from the attacks of the insect. The substance thus obtained is largely used in the manufacture of the well known lacquered ware of Hyderabad.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SInd.<br>7                                 |
| <i>Central Provinces.</i> —Large quantities of lac are found in all the districts<br>of these Provinces, but particularly in the more Eastern parts. It has been<br>stated that the Central Provinces could readily supply some 25,000 tons of<br>stick-lac annually, A considerable amount is consumed locally for the<br>manufacture of bracelets and other articles, but most districts also export to<br>a greater or less extent. The incrustation is collected by jungle-tribes,—<br>Bahelyas, Rajhors, Bhirijas, Kurkus, Dhanuks, Nahils, Bhois, and some<br>classes of Muhammadans—who sell the produce in small quantities to<br>Patwas, who again retail it in larger quantities to the regular dealers.                                                                                                                                                                                                                                                                       | Central<br>Provinces.<br>8                 |
| <i>Mysore.</i> —In this Province lac is produced in all three districts, but chiefly in Nundidrug. It is, however, not known how much might be pro-<br>curable annually, the produce being collected in many places by several petty contractors, but the supply is certainly large, and probably capable of increase. At present nearly the whole production appears to be con-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |
| sumed locally, since the exports from Madras and Mysore are very small.<br>Burma.—hs already stated the vast forests of Burma are capable of<br>producing an almost unlimited quantity of lac. The chief sources of com-<br>mercial Burmese, lac are the Shan States and Upper Burma, "stick-lac"<br>from these places being imported in considerable quantity into Calcutta,<br>where it is remanufactured into "shell-lac," for export.<br>Endeavours have been made in various parts of India to increase the<br>quantity and improve the quality of lac by artificially rearing the insect on<br>& e most suitable trees. For a complete resumé of the information re-<br>garding these experiments the reader is referred to Mr. O'Conor's exhaus-<br>tive note on the subject.                                                                                                                                                                                                     |                                            |
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| LAC.                             | Chemical Composition of Lac.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| PESTS.<br>ZZ<br>CHEMISTRY.<br>12 | Pests.—Besides the damage brought about by fire, drought, and frost,<br>the lac-insect is subject to the attacks of various enemies, which frequently<br>cause great havoc and materially decrease the lac crop. These are fully<br>dealt with in the <i>Indian Forester</i> , <i>Vol. /, 281</i> , by Mr. McKee, who writes :—<br>'  The ant, both large and small, attends the female cells for the purpose of<br>licking up the sweet excrement; they do not appear to hurt the insect be-<br>yond biting off the ends of the white filaments, and thus bringing many an<br>occupant of the cells to a premature end by cutting off the supply of<br>breathing air, which the filaments serve to convey through the holes in the<br>lac. Where ants are seen about the lac, it never appears healthy, and many<br>cells are found with the insect dead inside them. The lac whilst on the tree<br>is also attacked by the larva of a moth, which appears to be a species of<br>Galleria, belonging to the ninth section of the Nocturnae, named Tinetes by<br>Latreille, oneof which is famous for eating the honeycomb of bees, living<br>on their larvae, and destroying their wax. A second species was also de-<br>tected, which appeared to belong to the Genus Tinea. The ravages of<br>these insects destroy the colouring matter contained in the females, and a<br>brood of young is never obtained from the cells visited by them.<br><sup>11</sup> At present there seems to be no way of protecting the lac from the<br>depredations of these larvae. The ants, however, may be circumvented in<br>* two ways—either by surrounding the trees with wooa-ashes, or by some-<br>thing sufficiently attractive to draw their attention away from the encrust-<br>ations.''<br>Chemical Composition.—The following analyses are given by Mr.<br>Hatchett:— |
|                                  | <ul> <li>thing sufficiently attractive to draw their attention away from the encrustations."</li> <li>Chemical Composition.—The following analyses are given by Mr. Hatchett:—</li> <li>Stick-lac' Resin, 68; colouring extract, 10; wax, 6; gluten, 5*5; extraneous substances, 6*5; loss, 4. per cent.</li> <li>Seed-lac.—Resin, 88*5; colouring extract, 2*5; wax, 4/5; gluten, 2 per cent,</li> <li>Shell-lac.—Resin, 90*9; colouring extract, 0*5; wax, 4; nitrogenous matter, 2*8 per cent.</li> <li>Ir (Ire's Dictionary of Arts, Manufactures, &amp;c, the following more elaborate analysis by Dr. John is given :—</li> <li>Stick-lac in 120 parts contains—An odorous common resin, 80; a resin insoluble in ether, 20; colouring matter analogous to that of cochineal, 4*5; bitter balsamic matter, 3; dun-yellow extract, 0*5; acid {laccic acid}, 075; fatty matter like wax, 3; skins of insects and colouring matter, 2*5; salts, 1-25; earths, 0-75; loss, 375. The writer of the same article continues,—</li> <li>'' The resin may be obtained pure by treating shell-lac with cold alcohol, and filtering the solution in order to separate a yellow-grey pulverulent matter. When the alcohol is again distilled off, a brown, translucent, hard and brittle resin of specific gravity 1-139 remains. It melts into a</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                  | viscid mass with heat, and diffuses an aromatic odour. Anhydrous alcohol<br>dissolves it in all proportions. According to John it consists of two resins,<br>one of which dissolves readily in alcohol, ether, the volatile and fatty oils,<br>while the other is little soluble in cold alcohol and is insoluble in ether and<br>the volatile oils. Unverdorben, however, has detected no less than four<br>different resins and some other substances in shell-lac. Shell-lac dissolves<br>with ease in dilute muriatic and acetic acids, but not in concentrated sul-<br>phuric acid. The resin of shell-lac has a great tendency to combine with<br>salifiable bases, as with caustic potash, which it deprives of its alkaline<br>taste.<br>This solution, which is of a dark-red colour, dries'into a brilliant, trans-<br>parent, reddish-brown mass, which may be re-dissolved in both water and<br>"FOP" 1. ^ P <sup>assin</sup> g chlorine in excess through the dark coloured alkaline<br>solution, the lac-resin is precipitated in a colourless state. When this pre-<br>L. 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Manufacture of Lac. ( <b><i>J</i></b> . Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | LAC.                                  |
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| cipitate is washed and dried, it forms, with alcohol, an excellent pale-yellow varnish, especially with the addition of a little turpentine and mastic. With the acid of heat, shell-lac dissolves readily in a solution of borax. The substances which Unverdorben found in shell-lac are the following:—I, a resin soluble in alcohol and ether; 2, a resin soluble in alcohol, insoluble in ether; 3, a resinous body, little soluble in cold alcohol; 4, acrystallisable; resin; 5, a resin soluble in alcohol and ether, but insoluble in petroleum, and uncrystallisable; 6, the unsaponified fat of the coccus insect, as well as oleic^and margaric acids; 7, wax; 8, the <i>laccine</i> of Dr. John; 9, an extractive colouring matter" <i>{p. 786</i> }. White shell-lac changes rapidly on exposure to the air, becoming, within a fortnight of its preparation, incapable of solution, and is generally kept in water for this reason. Manufacture.—The method ordinarily employed has been already described ( <i>Vol. II.</i> , <i>411</i> ), but the following interesting account by Mr. O'Conor fcf the improved process adopted at Cossipore may be quoted as likely to be of value : — | CHEMISTRY.<br>MANUFAC-<br>TURE.<br>13 |
| a platform on the other side. These are afterwards again examined by<br>women, and all the remaining lac separated by hand, and, as far as it may<br>be worth while, used in manufacture. The refuse is bought by natives for<br>the manufacture of <i>choories</i> and other articles made of lac. The sticks are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |
| used for fuel in the furnace of the steam-engine.<br>"The lac is now placed in a horizontal cylinder furnished internally with<br>arms, arranged on a bar passing through the cylinder from end to end.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |
| These arms are worked by steam power, and their action, combined with<br>water with which the cylinder is filled, breaks up the lac into very small<br>pieces, and separates the colouring matter which forms lac-dye. Lime is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |
| frequently employed to assist in the precipitation of the dye when the water<br>is not naturally impregnated with lime. In the liquid thus obtained the lac<br>is left to soak for twenty-four hours in a large vat, the liquid being then<br>drawn off by the removal of plugs into a vat on a lower level and there                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       |

is not naturally impregnated with lime. In the liquid thus obtained the lac is left to soak for twenty-four hours in a large vat, the liquid being then drawn off, by the removal of plugs, into a vat on a lower level, and there left to settle in the same way as indigo, the colouring matter being precipitated to the bottom. The clear water at top is drawn off, and the sediment, after having been passed through a strainer, much of the same nature as that used by paper-makers for the straining of pulp, is finally allowed to settle and consolidate, when it is pressed in frames into cakes, which are afterwards dried in the sun. These cakes are the lac-dye of commerce.

"The lac, now called 'seed-lac,' after maceration, is thoroughly melted in a close vessel heated by steam, and thence conducted into open shallow troughs, also heated by steam, where the melting continues. Some resin is here mixed with the lac, to act as a flux and to prevent the lac from burning and adhering to the vessel. The resin, which is probably useful for this purpose, flies off, at least in great part, during the process of ebullition. But I may remark here that great complaints have been made in Calcutta of the adulteration of shell-lac with resin by some unscrupulous

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| LAC.                | Lac-dye as a Cosmetic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MANUFAC-<br>TURE.   | native manufacturers. Undoubtedly the high prices offered in 1874 en-<br>couraged adulteration. It is said that what was then offered as lac often<br>consisted of resin to the extent of 50 and even 60 per cent., and it may be<br>that the practice still exists. Lac thus adulterated may be detected by<br>its smell when broken.<br>"Ranged round the troughs are a series of zinc columns, inclined out-<br>wards at an angle of 45°. These columns are hollow, and being supplied<br>by pipes with tepid water, are maintained at a certain temperature. They<br>must never become too hot, or the fluid lac would not consolidate; nor<br>must they become too cool, for then the lac would harden at once, and<br>break up into small fragments which would adhere to the surface of the<br>column. A quantity of the melted lac is now taken up by a workman in<br>the concavity of a piece of plantain-bark, this being the material best<br>adapted to the purpose, and dexterously flung on to one of the columns.<br>Here the liquid mass is spread evenly and thinly over the surface by a man<br>who makes use, for the purpose, of a leaf of the pine-apple plant or some<br>other tough fibrous material. The leaf being held in both hands, its edge<br>is drawn over the liquid until the mass is properly spread over the surface<br>of the column to the required degree of fineness. It begins to consolidate<br>at once, and becomes of a pliable, leathery texture. As soon as the lac is<br>thoroughly consolidated it is taken off by .a workman, while still so hot that<br>it would burn the fingers of any person not accustomed to the work, a<br>considerable section of the upper portion of the sheet of lac being torn off,<br>because it is thicker there than in the rest of the sheet, and thrown back<br>into the trough to be melted again. The sheet is placed on a rod held in<br>readiness by a woman, each extremity of the sheet hanging down like a<br>towel on a" rack, and the whole is hung up to dry in a large drying-shed,<br>the rods supporting the lac being ranged on supports running across the<br>shed from side to side, just like a tobacco drying-h |
| USES.<br>Dye.<br>14 | <sup>M</sup> The points in which Messrs. Angelo's machinery differs from the ordinary processes are— (1) the triple system of rollers and sieves, and the endless chain of receivers; (2) the strainer for lac-dye, which is made of metal; (3) the system of melting the seed-lac by the action of steam; and (4) the hollow zinc columns with the arrangement for keeping them at an equable temperature. The natives use stems of plantain-trees, which do not last of course for more than a day, and the European improvement of porcelain and stone columns is inferior to Mr. Angelo's invention. This factory turns out on an average 100 maunds of shell-lac a day, from 200 maunds of stick-lac, for six months in the year, working from October to April; and with a sufficiency of raw material it could turn out 150 maunds a day during the whole year."<br>USES.<br>Dye.—For a description of lac-dye, the reader is referred to Volume II., 412. In addition to the information there detailed the following account of its utilisation as a cosmetic in India may be quoted from McCann:—" Lac-dye seems to be employed in various parts of Bengal by native women as a cosmetic for dyeing the soles of the feet and the palms of the hands or tips of the fingers, taking the place of <i>mehndi</i> or <i>henna</i> (Lawsonia alba) which is almost universally employed for that purpose. To prepare this cosmetic pieces of stick-lac are bruised in water, and cakes made either of cotton (Murshiddbacl) or of the similar floss covering the seeds of the <i>mudar</i> (Calotropis gigantea) are steeped in the water so that the fibres may attract the dye. These are the cakes used as cosmetics, either by wetting them on the hands and feet, or else by soaking them in water, and applying the water to the skin. The cakes are called <i>alia.</i> "                                                                                                                                                                                                                                                                                                                             |

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| Domestic Uses of Lac. (J. Murray,)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | LAC.            |
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| Medicine.—A decoction of shell-lac is much used in Hindu medicine for<br>preparing several medicinal oils, such as <i>Ldkshddi tał la</i> , <i>Chandanddi taila</i> ,<br><i>Angdraka taila</i> , &c. (U. C. Dutt). Honigberger states that the substance<br>was officinal at Lahore during the Sikh rule, being used in enlargement<br>of the liver, dropsy, ulcers, &c, and also, in the form of a varnish, as an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MEDICINE.<br>15 |
| by the first, they are seen as a set of the form of a variation as an application to wounds.<br>Domestic, &c.—Lac is largely used in India for the manufacture of bracelets (c <i>Huits</i> ), rings, beads, and other trinkets worn as ornaments by women of the poorer classes, and also in the production of turned wood-lacquer work. It appears to have been employed from very remote times for the latter purpose, perhaps the earliest description of the process being that of Linschoten in the sixteenth century, who, in describing the lac of Pegu, wrote as follows:—" Being refined and cleansed they make it" (the lac) " of all the colairs of India. Then they dresse their bedsteds withall, that is to say, in turning of the woode, they take a peece of lac of what colour they will, and as they turne it, when it commeth to his fashion, they spread the lac upon the whole peece of woode which presently, with the heat of the turning (melteth the waxe, so that it entereth into the crestes, &c.), cleaveth unto it about the thickness of a man's naile: they then burnish it (over) with a broad straw or dry rushes so (cunningly) that all the woode is covered withall, and it shinch like glasse, most pleasant to behold, and continueth as long as the woode being well looked unto. In this sorte they cover all kinds of household stuffe in India, as bedsteddes, chaires, stooles, &c., and, all their turned wood-work, which is wonderful common and much used throughout all India." This description agrees almost exactly with the process now commonly employed, excepting that, instead of the grass and rushes referred to as used for polishing, a dry palm leaf stalk, cut chisel-wise, and an oiled piece of rough muslin, are generally substituted. Lac-turnery of this description reaches a high development in certain parts of the Panjab and Sind, perhaps the most esteemed being that of Pak Pattan in the Montgomery district. The following description of the method employed may be quoted from a note by Mr. Kipling:—"The most notable industry of the Montgomery d |                 |

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| LAC.                 | Domestic Uses of Lac.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| DOMESTIC.            | Coats of different colours are super-imposed on the surface, and the pattern<br>is produced by scratching through these with a sharp stylus. Thus a ree<br>flower is made by scratching through the black and green films; for th<br>leaves the black only is cut away exposing the green; and for a white lin<br>all these are cut through to the white wood. This is obviously work requir<br>ing great delicacy of hand and long practice. The articles made at Pal<br>Pattán, besides objects for native use, are tea-poys, toys, flower-stands<br>plateaux, chessmen, work-boxes, &c. The workmen are Muhammadans.'<br>Work of a similar nature but less pleasing, owing to the brilliancy of the<br>aniline colours which of late years have been largely employed to colour th<br>lac, is made in the Hoshiarpur district. In the work of the same dis<br>trict transparent lac colour is also used, being applied over a ground of the<br>foil. Lines are then scratched in the layer, and filled in with lac of another<br>colour. Various coloured lac is also considerably employed for coiburing<br>metal work.<br>The lac-ware of India is thus entirely different from the true lacquer<br>of Japan, which is made by applying a varnish made of the sap of Rhur<br>vernicifera, to the article on which, the reader is referred for a description<br>of true lacquer-ware, and the possibility of its manufacture in India.<br>Lac is also used as a varnish in India, for which purpose the dye is<br>generally left in the resin to secure a deep colour. In Burma it is employed<br>to fix the blades of knives and similar instruments in their handles. In<br>Bombay and elsewhere it is employed in manufacturing grindstones, for<br>which purpose it is mixed, after being ground, with fine river sand in the<br>proportion of one of the former to three of the latter, and moulded to the<br>desired form.<br>In Europe lac is chiefly used in the preparation of varnishes, and by<br>hatters, who stiffen the silk hats in common use by an application of a<br>mixture of shell-lac, sandarach, mastic, and other resins, dissolved in alco-<br>hol or naphtha. It is also largely emplo |
| TRADE.<br>Lae.<br>17 | Mr. O'Conor recommends to the pignent lake, which last unisation<br>Mr. O'Conor recommends to the consideration of manufacturers of lac-<br>dye in India. Lacquer, prepared for giving a golden colour to brass and<br>other metals, at the same time preserving their lustre, is made by add-<br>ing gamboge, saffron, or some other transparent yellow, to an alcoholic<br>solution of shell-lac.<br>Trade.—LAC.—A consideration of the foreign trade in lac—shell, button,<br>stick, and other kinds, not including lac-dye—shews that while the quantity<br>exported during the last ten years has on the whole increased, the price of<br>the article, and the consequent relative value of the total exports has con-<br>siderably decreased. During the ten years ending 1875-76 the quantity in-<br>creased more than 120 per cent. The last year of that decade shewed a spe-<br>cial increase, the total exported being 92,915 cwt, value 872,91,751. In the<br>five years ending 1883-84 the average total export was 99,723 cwt., value<br>^57*48,415, while during the five years ending 1838-89 " amounted to<br>139*263 cwt., value 1*52,08,973. The average value of 1 cwt. of lac has thus<br>fallen from R78 in 1875-76 to R37 in 1888-89. F <sup>or</sup> many years shell and<br>button-lac were subject to an export duty, which, however, was remitted,<br>together with that on most other articles of merchandise, in February 1880.<br>Lac is exported chiefly in the form of shell-lac, and, to a smaller extent, as<br>button-lac. The unmanufactured form, stick-lac, is exported only to a very<br>small extent.<br>IT -Ti <sup>6</sup> 15 <sup>out</sup> j <sup>ries which</sup> constate the principal markets for lac are the                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| Trade in Lac and Lac-dye. {J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | LACTUCA        |
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| ed by France, Austria, Germany, Italy, Australia, Belgium, China, the<br>Straits Settlements, Spain, and Holland. Nearly the whole quantity goes<br>from Bengal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TRADE.<br>Lac. |
| During the five years ending 1883-84 an average of 11641 cwt. of lac,<br>valued 847,573, is shewn as imported from foreign countries; in the four<br>years ending 1888-89 the amount increased to 2,194 cwt., value R49,808.<br>Nearly the whole of this consists of stick lac, imported into Calcutta from<br>the Straits Settlements to be manufactured into shell-lac and re-exported.<br>The inland trade in lac for the year is valued at 101 lakhs of rupees. Cal-<br>cutta received 17 lakhs from Bengal, 32 lakhs from the North-West Pro-<br>vinces and Oudh, and 11 lakhs from Assam. The North-Western Provinces<br>collect the produce of the Central Provinces, the Panjáb, and Rewah for<br>exportation, and a portion of the consignments from Bengal to Calcutta<br>consists of re-exports of arrivals from Assam.<br>LAC-DYE. —The export trade in this substance was once a very import-<br>ant and profitable one, but of late years it has dwindled away to almost no-<br>thing. As early as 1875 Mr. O'Conor wrote:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Lao-dye.<br>18 |
| " Commencing in 1865 with a valuation twice as high as that of shell-<br>lac, we see lac-dye fall gradually from 1872, until during the last two years<br>the market value has been for the better sorts barely half the price of shell-<br>lac, while the inferior kinds are hardly saleable at any price. Lac-dye in<br>fact is now of very minor importance, both in the eyes of manufacturers and<br>shippers, as compared with shell-lac. It has always had competitors in<br>cochineal and other dyes, but lately the competition of mineral dyes has be-<br>come very formidable. These aniline dyes are produced so cheaply and<br>are worked so easily, that they threaten to supersede the use of most vege-<br>table dyes, and it is probable that the prospects of Indian dyes will before<br>long require much consideration from the State and all interested in them.<br>"When in 1871 a tariff value of R45 per cwt. was placed on lac-dye, the<br>article occupied a place relatively to shell-lac which it no longer occupies,<br>and to which it will probably never again attain. The tariff valuation was<br>far above the real value of the inferior kinds, and the duty therefore pressed<br>heavily on them, representing indeed a real levy of six times 4 percent and<br>more. Taking these facts into consideration, and having regard to the<br>small importance of the revenue derived from the duty (about R28,000 a<br>year on the average) the Government of India, by Notification dated 27th<br>November 1874, removed lac-dye altogether from the list of dutiable exports.<br>The remission of duty has no doubt so far been a relief to manufacturers,<br>but it has not had any substantial affect in reviving the trade " |                |
| but it has not had any substantial effect in reviving the trade."<br>At the present time lac-dye is manufactured only because it is a neces-<br>sary by-product in the preparation of shell-lac, but being almost unsaleable<br>in Europe, it is an export of very little value. During the five years ending<br>1883-84, the average export was 6,010 cwt., value RI,OI,803J while in the<br>past five years ending 1888-89, the average export was only 684 cwt., value<br>863,3^5. In 1887-88 the total quantity was only 279 cwt., in 1888-89, 334<br>cwt. The average price per cwt. has fallen from approximately R57 in<br>1865 to R24 in 1888-89, and while the former average includes the inferior<br>kinds once saleable, the latter represents the price obtained for the very<br>best quality, which is the only form now saleable at any price. The foreign<br>market is the United Kingdom.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
| LACTUCA, Linn. ; Gen. PL, VII., 524.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |
| A summer of the Nicksond Onder COMPACTER which as 1 (0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1              |

A genus of the Natural Order COMPOSITE, which comprises some 60 species, of which 22 are known to be natives of India. The name is derived from the milky juice contained in the stems and leaves, &c.

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| LACTUCA<br>Scariola,        | The Lettuce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| 19                          | Lactuca remotiflora, DC; Fl. Br. Ind., III., 403; COMPOSITE.<br>Syn— LACTUCA SCHIMPERI, Jaub. &Spach. BRACHYRAMPHUS SONCHI-<br>FOLIUS, DC.; CACALIA SONCHIFOLIA, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | VetnUndira-cha-kan (" rat's ear"), MAR.; Taraxaco, PORTUO. TM <sup>Go</sup> *'<br><b>References.</b> —Dais. & Gibs., Bomb. Fl., 132; Dymock, Mat. Med. W.<br>Ind., 2nd Ed., 462.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                             | Habitat.—A small delicate herb, native of Banda and Sind; distnDweu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| MEDICINE,                   | to Arabia. The whole plant is used at Cas as a substitute top 1 annu*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 20                          | Medicine.—The whole plant is used at Goa as a substitute tor 1 arax*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 21                          | cum (Dymock).<br>L. Scariola, Linn., Fl. Br. 2nd., III., 404.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                             | <b>L. Scalibla, <i>Linn.</i>, <i>Ti. Di. 2nu.</i>, <i>III.</i>, 404.<br/>THE LETTUCE.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                             | Var. sativa.—bYN.—LACTUCA SATIVA, Linn.; L. BRACTEATA and*SATIVA,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                             | Vera.—Kdhti, salad, khas, HIND.; Salad, kdhi, BENG.; Kdhit, PB. ARAB.;.<br>SIND; Shalldttu, TAM.J Kdvu% TEL.; Salada, SING. 5 Khas, A<br>KdlU, PERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                             | <ul> <li>References— Poxb., Fl. Ind., Ed C.B.C., 593; Stewart, Pb. PL<sub>9</sub>n7/<br/>DC, Origin Cult. PI., 95; Mason, Burma &amp; Its People, 473, 789 / Attention, Bot. Afgh.Del. Comm. in Trans. Linn. Soc, III., Pt. /., 83, 'Aittslte, Mat. Ind., I., xxiii; O'Shaughnessy, Beng. Dispens., 406; Moodet* Sheriff, Supp. Pharm. Ind., 167; Djyuiock, Mat. Med. W. Ind., 2nd ha., 459; Fliick. &amp; Hanb., Pharmacog., 39*; Bent. &amp; Trim., Med. PL, 1?' &gt; S. Arjun, Bomb. Drugs, 79 i Murray, PL and Drugs, Sind, 187; Irvine, Mat. Med. Patna, 57, "4: Baden Powell, Pb. Pr., 355; Atkinson, Hit*. Dist., 703; Ec. Prod. NW. P., Pt. V., 18; Lisboa, U. PL, Bomb., "W;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                      |
|                             | , Birawood, Bomb. Pr.,49; Cooke, Oils and Oilseeds, 5; Spons Mincyclop.,<br>1414; Smith, Die, 243 / Kew Reports, 88; Gaeetteers.—Mysore and<br>Coorg, I., 62/ Bombay, VIII., 184; NW. P., I., 82.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                             | Habitat.—A large, somewhat prickly herb of the Western Himalaya<br>from Marri to Kunawar, at altitudes of 6,000 to 11,000 feet, found also in<br>Western Tibet, at altitudes of 9,000 to 12,000 feet; distributed to Siberia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                             | and westwards to the British Isles and the Canaries. Var. sativa (the common garden lettuce) is more succulent, much smaller and quite smooth, and is cultivated throughout India, as a cold season garden vegetable. The economic information given in this article deals entirely with the cultivated variety.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| OIL.<br>Seeds.<br><b>22</b> | <b>Oil.</b> —The SEEDS yield a clear, sweet, transparent oil, a sample of which from Lahore was shown at the Pan jab Exhibition in 1864. No definite information appears to exist regarding its method of preparation,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| MEDICINE.                   | cost, or probable economic value.<br>Medicine.—The lettuce has always been held in high estimation in the<br>East on account of its cooling and refreshing properties. "The seeds are<br>one of the foui lesser cold seeds of old writers, and as such still retain their                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Laetucarlum.<br>24          | position in the Materia Medica of the East. Mir Muhammad <i>Hussain</i> , in<br>his <i>Makhzan</i> , mentions several kinds of lettuce, and also lettuce opium,<br>but he acknowledges the superiority of the lettuces raised from English<br>seed in India over that of Persia, and enlarges upon the cooling and puri-<br>fying action of the herb upon the blood." ( <i>Dymock</i> ). The plant appears,<br>however, to be unknown to Hindu medicine. To the ancient Greeks and<br>other European nations, the soporific action of the plant ( $d^{/S} \ll f$ of the<br>Greeks) was well known. LACTUCARIUM, the concrete juice obtained by<br>incision and spontaneous evaporation of the juice, is officinal in the United<br>Mates Dispensatory, but though formerly recognised in the London, Edin-<br>burgh, and Dublin Pharmacopoeias, it is no longer officinal in the Pharma-<br>copceia of the United Kingdom, nor in that of India. In these publications<br>its place is supplied by the inspissated juice of Lactuca virbsa, <i>Linn</i> . In<br>L. 24 |

| Action and Uses of Lactucarium 19, 19, Marray.) virosa.<br>addition to these two sources, Lactucarium may also be obtained from L.<br>altissima, Bieh., a native of the Caucasus, now cultivated in Auvergne for<br>that purpose.<br>CHEMICAL COMPOSITION.—Lactucarium is a mixture of various<br>torganic substances, together with 8 to 10 per cent, of inorganic matter.<br>It is not completely taken up by any solvent, and when heated softens,<br>but does not melt. The principal constituents are <i>lactucon or lactucerin</i> ,<br><i>lactucin</i> , and <i>lactucic acid*</i> Lactucon when pure occurs in the form of<br>colourless needles, which are without odour or taste, neutral, and insoluble<br>in water, though readily soluble in alcohol or ether. It resembles mannite,<br>a peculiar variety of sugar contained in manna (see Vol. III., 442), and<br>is also analogous to euphorbon, echicerin, taraxacerin, and cynanchol.<br>Latucin forms white pearly scales, readily soluble in acetic acid, insolu-<br>ble in ether, and with a strongly bitter taste. Lactucic acid when first<br>obtained is a light yellow, annorphous mass, but after standing for some<br>time, it assumes a crystalline appearance.<br>ACTION AND USES.—Lactucarium appears to be a mild hypnotic,<br>which, however, owing to its extreme uncertainty, is now very rarely pre-<br>scribed. It may be administered in doses of from two to ten grains, as<br>a mild soporific in cases not suited for the exhibition of opium. It has<br>the reputation of being-sedative, anodyne, purgative, diuretic, diaphoretic,<br>and antispasmodic, and useful in the treatment of phthisis, bronchitis,<br>asthma, and pertussis. Most of these properties, however, are probably<br>imaginary, since numerous experiments have failed to show that lactu-<br>carium possesses more than very slight sedative properties, if, indeed, it is<br>not absolutely inert. The anodyne property probably exists more largely<br>in the wild than in the cultivated letture.<br>SFECIAL OFINIONS.—§ "The seeds are given boiled, or made into a<br>conflection, in cases of bronchitis, especially chronic ones                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |
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| attissima, <i>Bich.</i> , a native of the Caucasus, now cultivated in Auvergne for<br>that purpose.<br>CHEMICAL COMPOSITION—Lactucarium is a mixture of various<br>organic substances, together with 8 to 10 per cent, of inorganic matter.<br>It is not completely taken up by any solvent, and when heated softens,<br>but does not melt. The principal constituents are <i>lactucin</i> on <i>lactucein</i> ,<br><i>lactucin</i> , and <i>lactucic</i> acid* Lactucon when pure occurs in the form of<br>colourless needles, which are without odour or taste, neutral, and insoluble<br>in water, though readily soluble in alcohol or ether. It resembles mannite,<br>a peculiar variety of sugar contained in manna (see <i>Vol. III.</i> , 442), and<br>is also analogous to euphorbon, echicerin, traraxacerin, and evmanchol.<br>Latucin forms white pearly scales, readily soluble in acetic acid, insolu-<br>ble in ether, and with a strongly bitter taste. Lactucic acid when first<br>obtained is a light yellow, anorphous mass, but after standing for some<br>time, it assumes a crystalline appearance.<br>ACTION AND USES—Lactucarium appears to be a mild hypnotic,<br>which, however, owing to its extreme uncertainty, is now very rarely pre-<br>scribed. It may be administered in doses of from two to ten grains, as<br>a mild soporific in cases not suited for the exhibition of opium. It has<br>the reputation of being sedative, anodyne, purgative, diurctic, diaphoretic,<br>and antispasmodic, and useful in the treatment of phthiss, bronchitis,<br>asthma, and pertussis. Most of these properties, however, are probably<br>imaginary, since numerous experiments have failed to show that lactu-<br>carium possesses more than very slight sedative property exists more largely<br>in the wild than in the cultivated lettuce.<br>SPECIAL OPINIONS—§ "The seeds are given boiled, or made into a<br>confection, in cases of bronchitis, especially chronic ones." ( <i>Surgeon-Major<br/>C. W. Calthrop, M.D., Morar).</i> "Lettuce poultice acts as a soothing<br>application to painful and irritable utcers" ( <i>S. M. Shir core, Civil Surgeon,<br/>Mursheddbdd).</i><br>Food.—The lettuce appears to have died out in Indi | Action and Uses of Lactucarium. (f. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LACTUCA<br>virosa. |
| CITEXITCAL COMPOSITION.—Lactucarium is a mixture of various OTEMICAL COMPOSITION.—Lactucarium is a mixture of various OTEMISTRY (CAL COMPOSITION.—Lactucarium is a mixture of various Distances, together with 8 to 10 per cent, of inorganic matter. It is not completely taken up by any solvent, and when heated softens, but does not melt. The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 125 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 125 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 125 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 126 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 126 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , 126 (1990). The principal constituents are <i>lactucon</i> or <i>lactucerin</i> , and expanchol. Latucen forms white pearly scales, readily soluble in anota (see <i>Vol. III., 442.</i> ), and is also analogous to euphorbon. echicerin, taraxacerin, and cynanchol. Latucen form some time, it assumes a crystalline appearance. Actron AND USES.—Lactucarium appears to be a mild hypnotic, which, however, owing to its extreme uncertainty, is now very rarely preseriments have failed to show that lactucarium possesses more than very slight sedative properties, if, indeed, it is not absolutely inert. The anodyne property probably exists more largely in the wild than in the cultivated lettuce. SPECIAL OFINIONS.—§ "The seeds are given boiled, or made into a confection, in cases of bronchitis, especially chronic ones" ( <i>Surgeon-Maing C. W. Calthropp, M.D., Morar.</i> "Lettuce poultice acts as a soothing application to painful and irritable ulcers" ( <i>S. M. Shir coree, Civil Surgeon, Mursheddbdd)</i> . FOOL—The lettuce appears to have been employed for food from very remote times; indeed, Herodotus informs us that it was served at the tables of Persian Kings more than 400 years before the Christian Fra. I.This being the case it is somewhat remarkable that all knowledge of its cultivation for food appears to have die                                           | altissima, Bieh., a native of the Caucasus, now cultivated in Auvergne for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MEDICINE,          |
| <ul> <li>which, however, owing to its extreme uncertainty, is now very rarely prescribed. It may be administered in doses of from two to ten grains, as a mild soporific in cases not suited for the exhibition of opium. It has the reputation of being-sedative, anodyne, purgative, diuretic, diaphoretic, and antispasmodic, and useful in the treatment of phthisis, bronchitis, asthma, and pertussis. Most of these properties, however, are probably imaginary, since numerous experiments have failed to show that lactucarium possesses more than very slight sedative properties, if, indeed, it is not absolutely inert. The anodyne property probably exists more largely in the wild than in the cultivated lettuce.</li> <li>SPECIAL OPINIONS.—§ "The seeds are given boiled, or made into a confection, in cases of bronchitis, especially chronic ones" (<i>Surgeon-Major C. W. Calthropp, M.D., Morar).</i> " Lettuce poultice acts as a soothing application to painful and irritable ulcers " (<i>S. M. Shir core, Civil Surgeon, Mursheddbdd)</i>,</li> <li>Food.—The lettuce appears to have been employed for food from very remote times; indeed, Herodotus informs us that it was served at the tables of Persian Kings more than 400 years before the Christian Era. This being the case it is somewhat remarkable that all knowledge of its cultivation for food appears to have died out in Indfa, until, comparatively recently, when it was re-introduced by Europeans. At the present time it is largely grown all over the country, from October to February as a cold season crop, but is rarely if ever eaten by the Natives, being cultivate almost entirely for the European population.</li> <li>LactUCa tatarica, C. A. Meyer, var. tibetica, Clarke; Fl. Br. Ind., Yem.—Khdwe, LADAK.</li> <li>References.—Clarke, Comp. Ind., 267; Stewart, Pb. PL, 128; Atkinson, Him. Dist., 312.</li> <li>Habitat.—A common herb in Western Tibet, at altitudes of 12,000 to 16,000 feet; distributed 10 Central Asia and Siberia.</li> <li>Fodder.—' It is occasionally browsed by sheep, but is said at tim</li></ul>                                                                                                                       | CHEMICAL COMPOSITION.—Lactucarium is a mixture of various<br>organic substances, together with 8 to 10 per cent, of inorganic matter.<br>It is not completely taken up by any solvent, and when heated softens,<br>but does not melt. The principal constituents are <i>lactucon</i> or <i>lactucerin</i> ,<br><i>lactucin</i> , and <i>lactucic acid</i> * Lactucon when pure occurs in the form of<br>colourless needles, which are without odour or taste, neutral, and insoluble<br>in water, though readily soluble in alcohol or ether. It resembles mannite,<br>a peculiar variety of sugar contained in manna (see Vol. III., 442), and<br>is also analogous to euphorbon, echicerin, taraxacerin, and cynanchol.<br>Latuein forms white pearly scales, readily soluble in acetic acid, insolu-<br>ble in ether, and with a strongly bitter taste. Lactucic acid when first<br>obtained is a light yellow, amorphous mass, but after standing for some                                                                                                                  | CHEMISTRY,<br>25   |
| Food.—The lettuce appears to have been employed for food from very<br>remote times; indeed, Herodotus informs us that it was served at the<br>tables of Persian Kings more than 400 years before the Christian Era.<br>This being the case it is somewhat remarkable that all knowledge of its<br>cultivation for food appears to have died out in India, until, comparatively<br>recently, when it was re-introduced by Europeans. At the present time<br>it is largely grown all over the country, from October to February as a<br>cold season crop, but is rarely if ever eaten by the Natives, being culti-<br>vated almost entirely for the European population.<br>LactUCa tatarica, C. A. Meyer, var. tibetica, Clarke; Fl. Br. Ind.,<br>Vem.—Khdwe, LADAK.<br>References.—Clarke, Comp. Ind., 267; Stewart, Pb. PL, 128; Atkinson,<br>Him. Dist., 312.<br>Habitat.—A common herb in Western Tibet, at altitudes of 12,000<br>to 16,000 feet; distributed 10 Central Asia and Siberia.<br>Fodder.—'' It is occasionally browsed by sheep, but is said at times to<br>produce bad effects '' (Stewart).<br>L. virosa, Linn.<br>THE STRONG-SCENTED LETTUCE.<br>This species is a native of Europe, imported into India for the prepar-<br>ation of the extract, which is officinal in the Pharmacopoeia. Its properties<br>are similar to those already detailed under Lactucarium, in the description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | which, however, owing to its extreme uncertainty, is now very rarely pre-<br>scribed. It may be administered in doses of from two to ten grains, as<br>a mild soporific in cases not suited for the exhibition of opium. It has<br>the reputation of being-sedative, anodyne, purgative, diuretic, diaphoretic,<br>and antispasmodic, and useful in the treatment of phthisis, bronchitis,,<br>asthma, and pertussis. Most of these properties, however, are probably<br>imaginary, since numerous experiments have failed to show that lactu-<br>carium possesses more than very slight sedative properties, if, indeed, it is<br>not absolutely inert. The anodyne property probably exists more largely<br>in the wild than in the cultivated lettuce.<br>SPECIAL OPINIONS.—§ "The seeds are given boiled, or made into a<br>confection, in cases of bronchitis, especially chronic ones" (Surgeon-Major<br>C. W. Calthrop <sub>9</sub> M.D., Morar). "Lettuce poultice acts as a soothing<br>application to painful and irritable ulcers " (S. M. Shir core, Civil Surgeon, |                    |
| <ul> <li>LactUCa tatarica, C. A. Meyer, var. tibetica, Clarke; Fl. Br. Ind.,<br/>Vem.—Khdwe, LADAK.</li> <li>References.—Clarke, Comp. Ind., 267; Stewart, Pb. PL, 128; Atkinson,<br/>Him. Dist., 312.</li> <li>Habitat.—A common herb in Western Tibet, at altitudes of 12,000<br/>to 16,000 feet; distributed 10 Central Asia and Siberia.</li> <li>Fodder.—" It is occasionally browsed by sheep, but is said at times to<br/>produce bad effects " (Stewart).</li> <li>L. virosa, Linn.</li> <li>THE STRONG-SCENTED LETTUCE.</li> <li>This species is a native of Europe, imported into India for the prepar-<br/>ation of the extract, which is officinal in the Pharmacopoeia. Its properties<br/>are similar to those already detailed under Lactucarium, in the description</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Food.—The lettuce appears to have been employed for food from very<br>remote times; indeed, Herodotus informs us that it was served at the<br>tables of Persian Kings more than 400 years before the Christian Era.<br>This being the case it is somewhat remarkable that all knowledge of its<br>cultivation for food appears to have died out in Indta, until, comparatively<br>recently, when it was re-introduced by Europeans. At the present time<br>it is largely grown all over the country, from October to February as a<br>cold season crop, but is rarely if ever eaten by the Natives, being culti-<br>vated almost entirely for the European population.                                                                                                                                                                                                                                                                                                                                                                                                          | 27                 |
| Him. Dist., 312.<br>Habitat.—A common herb in Western Tibet, at altitudes of 12,000<br>to 16,000 feet; distributed 10 Central Asia and Siberia.<br>Fodder.—" It is occasionally browsed by sheep, but is said at times to<br>produce bad effects " (Stewart).<br>L. virosa, Linn.<br>THE STRONG-SCENTED LETTUCE.<br>This species is a native of Europe, imported into India for the prepar-<br>ation of the extract, which is officinal in the Pharmacopoeia. Its properties<br>are similar to those already detailed under Lactucarium, in the description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | actUCa tatarica, C. A. Meyer, var. tibetica, Clarke; Fl. Br. Ind.,<br>Vem.—Khdwe, LADAK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 -                |
| THE STRONG-SCENTED LETTUCE.<br>This species is a native of Europe, imported into India for the prepar-<br>ation of the extract, which is officinal in the Pharmacopoeia. Its properties<br>are similar to those already detailed under Lactucarium, in the description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul> <li>Him. Dist., 312.</li> <li>Habitat.—A common herb in Western Tibet, at altitudes of 12,000 to 16,000 feet; distributed 10 Central Asia and Siberia.</li> <li>Fodder.—" It is occasionally browsed by sheep, but is said at times to</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FODDER.            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | L. virosa, Linn.<br>The strong-scented lettuce.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |

| LAGENAR<br>vulgaris. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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|                      | and more inert variety, <b>sativa</b> , the extract from L. <b>virosa</b> , is, perhaps, more constant in its properties, and consequently more trustworthy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4                    | LAGENARIA, Ser.; Gen. PL, I., 823.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 20 t                 | Lagenaria vulgaris, Serinqe; Fl. Br. Ind., II., 613; Wight, HI-,<br>[/. 10s; CuCURBITACEIE.<br>Syn.—LAGENARIA VITTATA, HispiDA.and IDOLATRICA, Serin &e CVCVR-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                      | BITA LAGENARIA, Linn,<br>BITA LAGENARIA, Linn,<br>Vern.—Cultivated iorm=Kaddi'i, al-kaddu,' got kaddu, lauki, laukd, !<**><br>kashiphal, mithi tumbi, wild iorm^tumri, tita Uu, HIND.; cultivate?<br>farm-Kodu, Za*, wild iorm^tikia Uu, BENG.; Kadu,SANTAL; Me-kurle<br>NAGA; Boga lao, ASSAM; Phusi, konkra, NEPAL; Kaddu, lau, lauki,<br>NW. P.; cultivated form=Kauka, wild form=tumri, KUMAO; Gol-<br>kaddu, BIJNOR; alava, SANAK; Keddú, kábuli kaddú, gol-kaddá, lauki,<br>tumba, PB.; Kaddú, iráo, hurrea-kadu, SIND; Kadú bhopalá, dudhya,<br>bkopla bija, MAR.; Tumadá, GUZ.; Soriai-kai, shora-kai, TAM.; Kundá-<br>nuga, dnapa ckettu, nélánuga, alú-buvu, ánuga kaya, ánapa káya, sora<br>káya, gubba kaya, 'TR*., Kaij, šy.k.; Mai vy, Rássin-swai, BURM.;<br>Diya-laba, SING.; cultivated iovm=*Aldbu, wild form=katutumbi, bANS.*<br>Kaddú, PERS.                                                                    |
|                      | References.—Roxb., FL Ind., Ed. C.B.C., 700; Rurz in Jour. As.Soc, if77f<br>Ft. ii, 100; Stewart, Pb. PL, 98; DC, Origin Cult. PL, 245—249.} £ <sup>(1)</sup><br>Flora Andhr., i3, 15, id, 37, 63, io3, i3i; Mason, Burma and Its Pe <sup>f i5,</sup><br>470, 747; O'Shaughnessy, Beng. Dispens., 343; U. C. Dutt, Mat. Beck<br>Hind. 200 30: Dumoch Mat. Med. W. Ind., 200 Ed., 30; S. Arjun,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                      | Bomb. Drugs, 59, 203; Med. Top. Ajm., 142; Baden Powell, Pb. Pr.,<br>O47; AiRinson, mm. uwt., 700; nconom. rrua., ilw. jr., * *;.' Liv<br>Duthie & Fuller, Field and Gatoen Crops, II., 48, PL xlvtn; II.,<br>boa, U. PL Bomb., 158, 26s; Stocks, Note on Sind; Balfour, Cyclop., d.,<br>6S2; Kew Reports, 70; Indian Forester, IX., 202; AgriHort. Soc. of it<br>Transactions, /., 41 s M., 196; IV., 104; VII., 64, 66; Journals (ui^<br>Series), IV., 202; VII., 69; IX., SeL, 58; X., 3; XIII., Set., 52,53; f <sup>a</sup> *fim<br>teers: —Mysore and Coorg, I.,61; Bombay', V., 29; Orissa, II., i*>> *y                                                                                                                                                                                                                                                                                                                       |
|                      | W. P., I., 81; IV., Ixxii; Settlement Reps.:-NW. P., Kumaon Afip*<br>33; Lahore, 14. j<br>Habitat.—A climbing plant found wild in India, the Moluccas, ana                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| CULTIVA-             | Abyssinia; extensively cultivated in America, Australia, and China, ana<br>many parts of India. The fruit assumes many different forms, the re-<br>sult of cultivation. Perhaps the most remarkable of these are the pil-<br>grim's gourd (in the form of a bottle), the long-necked gourd, the trumpet<br>gourd (shapes which are indicated by their names), and the calabash, which<br>is generally large, rounded, and devoid of a neck. The bottle gourd some-<br>times reaches as much as 6 feet in length. The flesh of the cultivated<br>forms differs from that of the wild, the former being sweet and edible, the<br>latter bitter, unpalatable, and sometimes even purgative. The species may,<br>notwithstanding the number of its forms, be popularly recognised by its<br>white flowers, and of the hardness the outer rind of the fruit.<br>Cultivation.—As already stated, this gourd is largely cultivated through- |
| 31                   | out India. The following information regarding the best methods, given<br>by Mr. Qollan in the <i>Indian Forester, IX., 202</i> , may, however, be quoted<br>as generally applicable :—<br>," It can be sown as early as February and as late as July. However/for<br>rainy season use, two sowings should be made, the first in April and the<br>second m June. The first sowing will be ready for use in the beginning<br>of the rains. The second will come in about the middle, and keep up the<br>supply until the cold season. It can be sown in nurseries and transplanted,<br>or sown at once where intended to be grown. The latter mode is prefer-<br>able, but if an empty plot be not available when the sowing season arrives,<br>it is better to ad The first named than let the sowing season slip past. It<br>succeeds tild the availy manured sandy soil, but will thrive ordinarily ^ell<br>L. 31                  |

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## The Bottle Gourd. (J. Murray.)

CULTIVAin any. When sown or transplanted, the seeds or plants should be inserted in patches 6 feet apart. No supports are required, as it prefers to trail along the ground. It should be weeded when necessary, until the patches interlace and cover the ground. Afterwards it will not require to be touched, as the dense network of branches will keep down the weeds.

As an example of the extent to which this gourd is Cultivated all over India, the following figures relating to the area under *kaddu* in certain districts of the North-West Provinces, during the rainy season of 1880, may be given on the authority of Messrs. Duthie & Fuller:- ' Allahabad, 202 acres; Meerut, 140; Mainpuri, 765 Shajahanpur, 61; Bulandshahr, 54; Bijnor, 37; Jalaun, 28; giving a total in these districts of 598 acres.

Oil.—The SEEDS yield a clear limpid oil, similar to that derived from thefcseeds of the cucumber. Beyond the fact that it is employed medicinally in certain localities, nothing is known of its properties.

**32** MEDICINE. Medicine.—The SEEDS were originally one of the four cold cucurbitaceous seeds of the ancients, but pumpkin seeds are now generally substituted for them (Dymock). They are, however, still considered cooling and are given internally as a remedy for headache. The OIL above described is also employed for headache, being applied externally. The PULP of the Wild form *tumri* is purgative, sometimes excessively so. Thus Lindley states that certain sailors were poisoned by beer which had been standing in a hollowed bottle gourd, the symptoms produced being similar to those attending cholera. It is said to be largely used, by native farriers in the Panjab, as a purgative for horses. The pulp of the Cultivated forms is occasionally employed as an adjunct to purgatives, and is also considered cool, diuretic, antibilious, useful in coughs, and an antidote to certain poisons. It is applied externally as a poultice, and as a cooling application to the shaved head in delirium. The LEAVES are purgative, and are recommended by Hindu physicians to be taken in the form of decoction for jaundice.

diarrhoea" (V. Ummegudien, Mettapolliam, Madras).

Food.—The cultivated forms are eaten both by Europeans and Natives, By the former the FRUIT is boiled when young and used as vegetable marrow. Firminger says that " cut up into slices in the manner of French Beans, it affords a palatable, but rather insipid dish about the beginning of the cold season." By the latter it is sliced and cooked in curry, or the pulp is eaten with vinegar, or mixed with rice. If hung in a free current of air it will keep well for three or four months, a property which ought to render it of value as a vegetable for sea-voyages. The YOUNG SHOOTS and LEAVES are in India also eaten by all classes.

Domestic and Sacred.-The dried shell of the fruit of the bottle-shaped gourd is used as a bottle for water, and by the Nagas for holding their  $su_{9}$ or beer. The small wild form *tumri* is used for making the stringed instrument, si  $tar_9$  and the wind instrument called bin. The latter, an instrument principally used by snake-charmers, consists of a double flageolet, fitted to a hollow and narrow-necked gourd.

In the Deccan and other localities the hollowed-out gourd is used as a float for crossing rivers, four or five being considered sufficient to support a man with a burden on his head.

## LAGERSTRCEMIA, Linn.; Gen. PL, /., 783.

A genus of trees or shrubs which belongs to the Naturl Order LYTHRACE^, and comprises 18 species, natives of South-east Asia, extending- to Australia. Burma is the centre of the genus. All the species are highly ornamental, and may be either propagated by seed, or by cuttings in garden soil. Leaves\* 36 Juice\*

**37** FOOD. Fruit. 38

Shoots. 39 Leaves. 40 DOMESTIC ft SACRED. 41

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TION.

OIL.

Seeds.

Seeds.

**33** Olit

Pufp.

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LAGERSTRCEMIA.

| <ul> <li>Lagerstroemia Flos-Regiue, Reti.; F.I. Br. Ind., //., 577; [Wight, Ic., t. jij; LYIBRACEE Syn.—L. REGIN*, Roxb.; L. MACROCARA, Wall.; ADAWBEA GLABRA Lamk.</li> <li>Var anguste, Wail.</li> <li>Marchan, Janual Assam, 'Bolachari, GARO, J Taman, bomiara-BOME; Bon dara, mota-bondard, RONKAN; Taman, taman?, motabon, dara, MAR.; Kadali, TAM.; Liennangi, TEL.; Cholid, holeddadi, mar-<br/>ig, KAN: ; Adamin, MiNDo, 1: ArU, BENG.; Garasaikre, KOL.; Sekra, SANTAL:, ANA:, Kadali, TAM.; Liennangi, TEL.; Cholid, holeddadi, mar-<br/>ig, KAN: ; Adamine, Markate, Steadom, F.I. Syk, L. 23; Gambi, Man. Timb., 202, 203; Date. &amp; Gibs., Bomb. FL, 98; Mason Barma and Its People, Pb, 537, 538, T58; Eddom, FL, Syk, L. 23; Gambi, Man. Timb., 202, 203; Date. &amp; Gibs., Bomb. FL, 98; Mason Barma and Its People, Pb, 537, 538, T58; Eddom, FL, Syk, L. 23; Gambi, Man. Timb., 202, 203; Date. &amp; Gibs., Bomb. FL, 98; Mason Barma and Its People, Pb, 537, 558, Kill, Flore, Andh., 36; Works, 635; HL, 197, 197, 197, 197, 197, 197, 197, 197</li></ul> | hypol                                                                                                       | CRCEMIA     A durable Timber.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| L. hypoteuca $Kurz., Pt. BR (194) Had s77.$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | RESIN.<br>43<br>IEDICINE.<br>Root<br>44<br>Bark.<br>Leaves.<br>46<br>Flowers.<br>Sc <b>48</b> s.<br>IIMBER. | [ Wight, Ic., t. jij ; LYIBRACEE<br>Syn.—L. REGIN*, Roxb.; L. MACROCARPA, Wall.; ADAWBEA GLABRA<br>Lamk.<br>Var anguste, Wail.<br>Vim.—Arjuna, jarM, HIND.; JarU, BENG.; Garasaikre, KOL.; Sekra<br>SANTAL ; Ajhar, jarul, ASSAM ; Bolashari, GARO. J Taman, bomiara-<br>BOMB.; Bon dara, mota-bondara, KONKAN; Taman, tamanr?, motabon,<br>dara, MAR.; Kadath, TAM.; Lhennang; TEL.; Challd, holeddsdl, mar-<br>uja, KAN.; Adambo, MALAY.; Yengma, Kone-pyinna, Dyinna, BURM.;<br>Kamaung, MAGH.; Murute, m&r&ta-gass, SING.; Arjuna, SANS.<br>References****, tf. /> <l, 240;<br="" ^="" brandr*,="" ctf.c.,="" fl.,="" for.="" jedf.="">Kurz, For. Fl. Burnt, I., 524; Beddome, Fl. Sylv., t. 29; Gambit, Man.<br/>Tamb, 202, 203; Date &amp; Gibs., Bomb. FL, 98; Mason Burma and Its<br/>People, p6, 537, 538, 758; Elliot, Flora Andh., 36; Works of Sir W.<br/>Jones, V., 147; Lisbon, U. PI. Bomb, 80; Birdwood'Bomb. Pr., 330?<br/>Smith. Die, 55; Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. For.—L, 112, 363; IL, 19; Ub<br/>AVI'151 "1995", Sir Kew Reports, 69; Ind. Core, J. Jir, 47, 505", Sir Kew Reports, 69; Ind. (Od Series), Jir, 400, Sir Kew Reports, 600; Ind. Cold Series), Jir, 400, Sir Kew Reports, 600; Ind. Cold Series, Jir, 400, Sir Kew Reports, 2005", Jir, 423].<br/>The Rev. J. Long, in an article on the Indigenous Plants of Bengal, states<br/>that the SEEDs are narcotic, the ba</l,> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 50 I                                                                                                        | L. hypoleuca, Kurz., Ft. BRA Pabad s77.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Cotul Timbors (1 Murray)                                                                                                                           | RSTRCEMI<br><u>viflora.</u> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Habitat.—A tall tree of the Andaman Islands, attaining a height of 60                                                                              |                             |
| to 70 feet.                                                                                                                                        |                             |
| Structure of the Wood.—Greyish-brown, narrow-streaked, dose-grained                                                                                | TIMBER.                     |
| and heavy, weighing 35 to 45ft per cubic foot. It is largely used in the                                                                           | 51                          |
| Andamans for building, shingles, and for constructive work generally.                                                                              |                             |
| Lagerstreemia indica, Linn.; Fl. Br. Ind., IL, 57 j; Wf., Ill, /. S6.                                                                              | 52                          |
| Syn.—LAGERSTRCEMIA ELEGANS, <i>Wall.</i> ; VELAGA GLOBOSA, <i>Gtertn</i> .                                                                         | i                           |
| Vern.—Phurush, telinga-china, HIND., BENG.; Dhdyti, BOMB.; Telanga-                                                                                |                             |
| china, TAM.<br>References.— <i>Roxb., FL Ind., Ed. C.B.C., 40<u>4</u>; Kurz, For. Fl.,</i> A, 5*';                                                 | 1                           |
| Mason, Burma and its People, 437; Indian Forester—V., 7g—8i; VI.,                                                                                  |                             |
| 125; VIII., 303, 438; Gazetteers:—Mysore and Coorg, I., 61; Bombay,                                                                                |                             |
| XVII., 24; Orissa, II., 178; Agri-Hort. Soc. of Ind. Journals :—11.,<br>* 356; IV., 208; VI., 41; (New Series), IV., 95 / VIII., 8.                | 1                           |
| Habitat.—-A handsome flowering shrub, possibly wild on the Eastern                                                                                 |                             |
| boundary of India, largely cultivated in gardens throughout the country                                                                            |                             |
| on account of its beautiful lilac-coloured flowers.                                                                                                |                             |
| L. lanceolata, Beddome? Fl. Br. Ind., II., tf6; Wight, /&, /. tog.                                                                                 | <b>S</b> 3                  |
| Syn.—L. MICROCARPA, Wight,                                                                                                                         |                             |
| VertL—Beda, bondaga, HIND.; Nana, sokuiia, MAR.; Sokuiia, Guz.;<br>Bentaeky venteak, TAM.; Banddra, nandi, bolundur, KAN.                          | <b>j</b>                    |
| References.—Brandts, For. FL, 240; Beddome, FL Sylv., t. 30; Gamble,                                                                               |                             |
| Man. Timb., 201; Data. & Gibs., Bomb. FL, 98; Lisboa, U. PL Bomb.,                                                                                 | 1                           |
| 79; Balfour, Cyclop., II., 6S3; Indian Forester .—//., 19; III., 23, 3\$7;<br>Gazetteers:—Mysore and Coorg, I., 48, 61; Bombay, XV., Pt. I., 33;   | ļ                           |
| Manual of the toimbatore District, 407.                                                                                                            | ł.                          |
| Habitat.—A large tree met with in the forests of the Malabar coast                                                                                 |                             |
| from Bombay to Travancore.<br>Structure'' of the Wood.—Red, moderately hard, straight and elastic,                                                 | TIMBER.                     |
| weight from 41 to 48ft per cubic foot; much used in construction, for                                                                              |                             |
| ship-building, in making coffee cases and furniture, also in the Konkan for                                                                        |                             |
| fish stakes, and firewood. If left exposed in the forest it soon rots, and                                                                         | 1                           |
| is rapidly attacked by white ants.                                                                                                                 | ]                           |
| L. <b>parviflora,</b> JRoxb. / H. <b>Br. Ind.,</b> IL, 575; Wight, Ic, <b>f.</b> 69.                                                               |                             |
| Syn.—LAGERSTRCEMIA FATIOA, <i>Blume;</i> FATIOA NEPAULENSIS, <i>Wall</i> .                                                                         | 55                          |
| Var. majuscula=L. LANCEOLATA, <i>Bedd.</i> not of <i>Wall</i> .                                                                                    |                             |
| Var. benghalensis.<br>Norm – Bdhli hat dhawaa landua asina sida asid HUND i Sida DENG                                                              |                             |
| Vern.—Bdkli, kat, dhaura, lendya, seina, sida, asid, HIND.; Sida, BENG.;<br>Salora, UKIYA; Saikre, KOL.; Sid ha, BEHAR; Sekrec, SANTAL; Sida, As-  | Į                           |
| SAM; Borderi, bordengri, NEPAL; Kan hi I, LEPCHA; Shi da, GARO; Shej>                                                                              | 1                           |
| BAND A; Stda, MICHI; Seji, BIJKRAGGOARH; Sina, velli, leria, GOND;<br>Chekerey, KuRKU; Dhaura, shej, NW. P.; Bdkli, dhdu, dhaura, PB.;             |                             |
| Sahine, CHANDA; Lendya, BAITUL; Kulia sija <sub>%</sub> lend*, BHUNDARA;                                                                           |                             |
| Tendiya, SEONI ; Nan a, bonddra, nandi, belli-nandi, sina, lendi, MAR. ;<br>Kakria, Guz.; Chungi/pilugu, HYDERABAD ; Katcha-catta-marum, TAM.;     |                             |
| Chenangi, TEL.; Ventaku, cheninge, channangi, banddra, KAN.; Tsam-                                                                                 |                             |
| belai, BURM.<br>Deferences Port El Ind Ed C.B.C. 401: Brandts For El 23a:                                                                          |                             |
| References.—Roxb., Fl. Ind., Ed. C.B.C., 40J; Brandts, For. FL,23g;<br>Kurz, For. FL Burm., I.,\$2i; Beddome, FL Sylv., t. J/, 32; Gamble,         | 1                           |
| Man. Timb., 200; Dalz. & Gibs., Bomb. Fl, 98; Stewart, Pb. PL, 90;                                                                                 | 1                           |
| Rev. A. Campbell, Ec. Prod., Chutia Nagpur, No. 8406 ; Mason, Burma<br>and Its People, 407 ; Atkinson, Him. Dist.,3iO; Ltiboa, U. PL Bomb., 79,    |                             |
| 245; Liotard, Dyes, 160, 169; McCann, Dyes & Tans, Beng., 160, 169;                                                                                |                             |
| Balfour, Cyclop., II., 653; Kew Reports, 69; For. Ad. Red., Chutia                                                                                 | !                           |
| Nagpur, 188s, 6, 3i; Agri-Hort. Soc. of India, Journals (Old Series) :—<br>VIII., SeL, 177; XIII., 309; (New Series).—K., 70; VII 134; Indian      |                             |
| Forester.—/., 87, 88, 99,275; III., 189, 202; IV., 322,366; V, 212;                                                                                | ł                           |
|                                                                                                                                                    |                             |
| VIIL, 270, 412, 414; IX., 438; X., 32^,326; XI., 252,288; XII., 31l,                                                                               |                             |
| VIIL, 270, 412, 414; IX., 438; X., 32^,326; XI., 252,288; XII., 31l,<br>3i3; XIII., 121 \ XIV., 147, 151; Gazetteers:—Mysore & Coorg, I.,<br>L. 55 |                             |

| LAGGERA<br>aurita.           | Useful Timbers.                                                                                                                                                                                                                                                       |
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|                              | ·                                                                                                                                                                                                                                                                     |
|                              | 50, 52, 61,11., 8, III., 22; NW.P.I.,8l;IV.,hxii; Bombay, VII.,<br>32,36; Xll.,71; XIII., 26; XVII., 25; XVIII., 49; Settlement Re-<br>ports, C. P.:-Nimar <sub>9</sub> 306;Seoni, 10,• Chindwara, no; Bhundara, 19}<br>Baital, 127; District Manual t—Cuddapah, 285. |
|                              | HabitatA large deciduous tree met with in the sub-Himálayan tract                                                                                                                                                                                                     |
|                              | from the Jumna eastwards, also in Oudh, Bengal, Assam. Central ana<br>South India. VAR. majuscula is common on the north-eastern edge of the                                                                                                                          |
|                              | Deccan plateau, in Chulia Nagpur, and in Bengal; while VAR. benghalensis<br>occurs in Nepál, Sikkim, Assam, and Burma.                                                                                                                                                |
| GUM.<br>Bark.                | Gum Lisboa writes, " The gum which exudes from the BARK IS said                                                                                                                                                                                                       |
| 56                           | to be sweet and edible."<br>Fibre.—Campbell reports' that the BARK yields a fibre, which is em-                                                                                                                                                                       |
| FIBRE.<br>Bark.              | ployed in Chutia Nagpur for the manufacture of ropes.                                                                                                                                                                                                                 |
| 57                           | Dye and Tan.—The BARK, along with that of ashna (Ternanalw-                                                                                                                                                                                                           |
| DTE <i>i "</i> TAN.<br>Bark. | tomentosa), is employed in Midnapur for dyeing skins black {McCanny<br>Lisboa states that the bark and LEAVES are used in Bombay lor tan-                                                                                                                             |
| Leaves.                      | ning, and the Rev. A. Campbell reports a similar utilisation of the bark in                                                                                                                                                                                           |
| <b>50</b><br>TIMBER.         | Chutia Nagpur                                                                                                                                                                                                                                                         |
| TIMBER.<br>60                | Structure of the Wood.—Very hard, grey or greyish-brown, often with<br>a reddish tinge, darker near the centre, weight from 40 to 60tb per cubic                                                                                                                      |
| 00                           | foot. It is tough, elastic, seasons well, works freely, and is fairly durable.                                                                                                                                                                                        |
|                              | Ten sleepers, laid down on the Oudh and Rohilkhand Railway in 1870,<br>were reported, on being examined in 1875, to be quite sound. A number                                                                                                                          |
|                              | of sleepers have also been tried on the Northern Bengal State Railway, but                                                                                                                                                                                            |
|                              | •he. results have not been published. The timber is largely employed for ploughs and other agricultural implements, for construction, for boats,                                                                                                                      |
|                              | buggy shafts and axe handles, and is said to yield good charcoal <i>{Gam''</i>                                                                                                                                                                                        |
| DOMESTIC.                    | ble; Beddome, &c).                                                                                                                                                                                                                                                    |
| 61                           | Domestic—This tree is one of those on which the <i>tasar</i> silkworm i» fed.                                                                                                                                                                                         |
| 62                           | Lagerstroemia tomentosa, Presl.; PL Br. Ind., II., s78.                                                                                                                                                                                                               |
|                              | Syn.—L. PUBESCENS, <i>Wall.</i><br>Vern.— <i>Laieya</i> , BURM.                                                                                                                                                                                                       |
|                              | <b>References.</b> — <i>Kure, For. Fl. Burnt., I., 523; Gamble, Man. Timb.,204/</i><br><i>Indian Forester *-VIII., 414; IX., 216; XI., 230; Gazetteer, Burma, /.»</i><br>/Jo.                                                                                         |
|                              | Habitat.—A large deciduous tree of Burma, frequent in Pegu and Martaban.                                                                                                                                                                                              |
| RESIN.                       | <b>Resin.</b> —It exudes a red resin {Kurz).                                                                                                                                                                                                                          |
| 63                           | <b>Structure of the Wood.</b> —Grey or greyish-brown, close-grained, moder-<br>ately hard, weight from 46 to 53 ft per cubic foot; valued for bows and                                                                                                                |
| TIMBER.                      | spear handles, also used for canoes and cart wheels.                                                                                                                                                                                                                  |
| 64                           | LAGGERA, SchBip., Gen. PL, II, 290.                                                                                                                                                                                                                                   |
| 65                           | Laggera aurita, Schultz-Bip.; FL Br. ImL, III., 271; COMPOSIT/E.                                                                                                                                                                                                      |
| •                            | Syn.—BLUMEA AURITA, DC.; B. GUINEENSIS, DC.; CONYZA AURITA, Linn-                                                                                                                                                                                                     |
|                              | <b>References</b> —Roxb., Fl. Ind., Ed. C.B.C., 602; Moodeen Sheriff, Supply Pharm. Ind., *j3.                                                                                                                                                                        |
|                              | and Habitat.—A common herbaceous weed in waste places from the Panj£b                                                                                                                                                                                                 |
| MEDICINE.<br>Plant.          | $TM^{in} \wedge {}^{to} Chitta} g^{\circ n} g$ . Burma, and South India.                                                                                                                                                                                              |
| 66                           | Medicine.—The whole PLANT has an odour of turpentine but does not<br>appear to have any known economic property. Of late years, however,                                                                                                                              |
|                              | it has been confused with some other compositous plant of medicinal value,                                                                                                                                                                                            |
|                              | <b>hight</b> ding which the following remarks by Dr. Q. Watt in the Calcutta Explem ^ t ^ f S Sf <sup>m a y be quoted</sup> "Moodeen Sheriff has, in his Sup-                                                                                                         |
|                              | p mena to the <i>PharmacoPaHa Indica</i> , gone into a long discussion as to the JL. 60                                                                                                                                                                               |
|                              |                                                                                                                                                                                                                                                                       |

| The Sweet Tangle.(7. ". LAMurray.)3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\frac{\mathbf{MINARIA}}{\mathbf{A} \mathbf{A} \mathbf{A}}$ |
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| correct scientific name of the <i>kakronda</i> (HIND.) or <i>kamaf&amp;Hs</i> (ARAB.). He describes the flowers as white and about the size of a largje pea. This precludes it from being Blumea aurita, <i>DC</i> , which has pink flowers. The colour of the capitula of this great natural order is a character of much more importance than almost in any other family, and we are therefore almost justified in saying that the white-flowered plant alluded to cannot be either a Blumea or a Laggera."                                                                                        | MEDICINE.                                                   |
| LALLEMANTIA, Fisch. et Mey. ; Gen. Pi., 11., 1200.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |
| Lallemantia Royleana, Benth.; Fl. Bn Ind., IV., 667 / LABIATJE.<br>Syn —DRACOCEPHALUM ROYLEANUM, iknM.; NEPETA ERODIIFOLIA, Boiss.<br>Venii—Seeds—Gharei kashmdlA, tukhm-lealanga, HIND.; seeds = Ghare <sup>*</sup><br>kashmdli, tukhm-malanga, tukhm-bdlangu, PB. \$ seeds =*Tukkm-i-bdlan-<br>git, BOMB.; secAs—Tukhm-i-bdUutgA, PERS.                                                                                                                                                                                                                                                            | 67                                                          |
| References Stewart, Pb. PL, 16S; Aitchison, Bot. Afghan Del. Com.,<br>in Trans. Linn. Soc, 2nd Ser., III., Ft. I., 97; Dymock, Mat. Med. W.<br>Ind., 2nd Ed. 614; S. Arjun, Bomb. Drugs, J00; Irvine, Mat. Med.<br>Patna, in; Honigberger, Thirty-five years in the East, II., 272; Atkin-<br>son, Him. Dist., 3iS; Birdwood, Bomb. Pr., 62; Settlement Rep.,<br>Lahore, 9.                                                                                                                                                                                                                          |                                                             |
| Habitat.—An annual erect herb, found doubtfully wild but usually culti-<br>vated in the hills and plains of the Panjáb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |
| Medicine.—The plant is largely grown on account of its mucilaginous<br>SEEDS, which are considered Cooling and sedative, and are extensively em-<br>ployed in the preparation of a mucilaginous beverage.                                                                                                                                                                                                                                                                                                                                                                                            | MEDICINE.<br>Seeds.<br>68                                   |
| <i>togamique, 2*j8.</i><br><b>LAMINARIA,</b> <i>Lam., Baillon, TraiU de Botanique Medicale Cryp</i> -<br>A genus of seaweeds, distinguished by largely developed, coriaceous, entire, or<br>palmate ribless fronds, which are supported on a foot, generally elongated,<br>simple, cylindrical and terminating in a strong scutiform base by which the<br>alga is attached to rocks. The only species which are known to exist on the<br>Indian coasts are L. digitata, <i>Lam., L.</i> bulbosa, <i>Ag.,</i> and L. saccharina,<br><i>Lam.,</i> of which the last alone is of economic importance. £ |                                                             |
| Laminaria saccharina, Lam. / Baill, Bot. Med. Crypt., be. åt.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 69                                                          |
| THE SWEER TANGLE. $C^{Turn} \rightarrow F^{LCe} \rightarrow '^{6} 3 \rightarrow '^{ALGJE}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                             |
| Vern.—Gilarpatr, HIND.<br>References.—Stewart, Pb. PI., 269; Dymock, Mat. Med. W. Ind., 2nd<br>Ed. <sub>%</sub> S74; Murray, PI. and Drugs, Sind, 3; Baden Powell, Pb. Pr., 384;<br>half our, Cyclop., II. <sub>9</sub> 664.                                                                                                                                                                                                                                                                                                                                                                         |                                                             |
| Habitat—A greenish-red seaweed, with a slight odour and sweetish taste, found in all deep seas, and frequently cast up on I ndian coasts.<br>Medicine.—After having been washed in fresh water and dried, the                                                                                                                                                                                                                                                                                                                                                                                        | bedicqte.<br>70                                             |
| thallus becomes covered with a white sweet efflorescence composed to a<br>great extent of mannite. The plant also contains much iodine and is em-<br>ployed as an alterative for the cure of goitre, scrofula, and syphilitic affec-<br>tions. Murray states that for the latter disease it is a favourite remedy<br>in Sind, being exhibited in the form of a syrup, in conjunction with a decoc-<br>tion of quince seeds.                                                                                                                                                                          |                                                             |
| The Sweet Tangle forms a regular article of commerce through Kashmir<br>to India, and is to be found in most bazárs of the Panj£b and Sind. Oayley<br>mentions that 16 seers were imported from Yárkhand to Leh in 1867.<br>Honigberger states that in his time the plant was officinal at Lahore and<br>Kashmir, and that the fronds were procured from Tibet, where, according<br>to native report, they grew in a salt lake. In all probability, however, they                                                                                                                                    |                                                             |
| τ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1                                                           |

| LANTANA                | A. An Injurious Shrub.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| industrial.<br>71      | may have been obtained from the Caspian, or may have come from the sea<br>via China.<br>The same writer describes it as useful in cases of anorexia, dyspeps <sup>**</sup> ,<br>fever, scrofulous ulcers, buccal ulceration (syphilitic ?), and tenesmus.<br>Another species, L. Cloustoni, is employed medicinally in Europe he<br>the manufacture of "tents" for expanding fistulas, the os uteri, &c. The<br>foot stalk is dried, pressed into as small cylinders as possible, cut to the<br>desired size, &c. by its expansion when placed in contact with injpistur the<br>exercises a powerful effect as a dilator. When washed in fresh water<br>thallus of this species sheds a large quantity of mucilage. When ane hich<br>however, is quite distinct chemically, being bitter and saline, consisting<br>for the most part of sulphate of soda. No record exists of this <b>species</b><br>having been found in Indian species of Laminaria are remark? Difference<br>in iodine, and if obtainable in any quantity might be utilised for the function<br>facture of that substance. L. digitata, which, according to Murray, is fulled<br>facture of that substance. L. digitata, which, according to Murray, is fulled<br>facture of that substance. L. digitata, which, according to Murray, is fulled<br>facture of that substance. L. digitata, which, according to Murray, is fulled<br>facture of the clifton and Manora beaches, Is said to yield a valuabi-<br>charcoal, which, when purified, dried, and finely powdered, postesses more<br>deodorizing and decolourising properties than animal charcoal itself.                                                                                                                                                                                                                                                                 |
| 72                     | LAMPRACHIENIUM, Benth.; Gen. PL, II, **S-<br>Lamprachaenium microcephalum! Benth.; Fl. Br, Ind., 111.,<br>[229; Composition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br><b>73</b> | Vern.—Brahma-dandi, BOMB.<br>References.—#«/*. & Gibs., Bomb. Fl., 122% Clarke, Comp.<br>Dymock, Mat. Med. W. Ind., 2nd Ed., 423.<br>Habitat —A much-branched annual, having an odour of chatnom<br>common in the Konkan.<br>Medicine.—" Used medicinally as an aromatic bitter" (Dyrnockh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 73                     | LANTANA, Linn.; Gen. PL, II, H4 <sup>2</sup> *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                        | A genus of rambling shrubs belonging to the Natural Order V.E * <sup>£</sup><br>NACEJE, and comprising 40 species, chiefly natives of Tropical ana <sup></sup> of<br>tropical America. Of these three are natives of India, but none arc<br>economic importance. One species, however, Lantana Camara, <sup>Un'''</sup> e<br>native of America, has run wild from cultivation in many parts or en-<br>country, especially along the Western Coast and in Ceylon, and is or on a<br>siderable interest, owing to the damage, which it has already done, anu<br>which is likely to increase with its extension. <sup>K1p</sup><br>This prickly plant grows so densely as to become perfectly impenetrapic<br>to men and cattle, and consequently may completely prevent the utilisation<br>of large areas. Owing to its extraordinary vitality it is extremely difficult<br>to exterminate. The only method of getting rid of the growth is said to De<br>by digging it up and burning it, root and branch, reappearing twigs being<br>similarly destroyed as soon as they are seen. A few writers, however,<br>have held that under certain conditions the Lantana growth is by no means<br>an unmixed evil, since, owing to its shade-giving properties and density, it<br>exercises a markedly renovating effect on the soil. Thus Mr. R. Thompson,<br>""Iff" <sup>m</sup> J <sup>h</sup> efirfuin <i>Forester</i> (Volume VI.), states that in his opinion it is<br>mgnly useful in tracts which have been deforested. The plant, according to<br>sol??' <sup>Pi<sup>a</sup></sup> r <sup>P1C</sup> !L <sup>yover</sup> S <sup>r</sup> owing such land, serves to retain the humus in the<br>forest th <sup>*</sup> KUTT <sup>s</sup> V * <sup>es</sup> that in the eve * t of the land again coming under<br>invest the light-loymg Lantana quickly dies out.<br><b>T</b> . <b>*</b> . <b>*</b> . |

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| Lapis Lazuni: The rever of Devit Neture. (7. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | APORTEA<br>renulata.   |
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| In cultivated and pasture lands, on the other hand, there is no doubt<br>that the shrub is a serious evil, and one against which it is difficult to<br>combat. Thus in the <i>Gazetteer of Mysore Sf Coorg</i> it is stated that it<br>has spread over the whole of Coorg and, covering as it does, many tracts<br>which might be much more profitably occupied, has rendered its extermina-<br>tion a matter of imperative necessity.                                                                                                                                                                                      |                        |
| Lapidary. For an account of the stones principally used in India in the lapidary's art, see the articles op Carnelian, &c, Volume II., 167 3 also Jade, p. 535; and Precious Stones, Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| LAPIS LAZULI, Ball in Man. Geology oflnd., III., 528-530.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| 0 A mineral of somewhat complex composition, containing silica, alumina, soda, lime, iron, sulphuric acid, sulphur, and chlorine. Its value has considerably decreased in modern times, owing to the discovery, by a French chemist, in 1828, of an efficient artificial substitute, the composition of which is identical or nearly so with that of the natural stone. The colour of both, which varies from a rich Berlin to an azure blue, is supposed to be due to sodium sulphide.                                                                                                                                     |                        |
| Lapis Lazuli, GeoL ofInd., IV. (Mineralogy, Mallet), gg.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 75                     |
| Vern.—Lajwdrd, HIND.; Lajburud, BEHAR; Rdjdvaral, Guz.<br>References.—Baden Powell, Pb. Prod., 64; Irvine, Mat. Med. of Patna,<br>60; Ain-i-Akbari, Gladwin's Trans., II., 183; Balfour, Cyclops II., 679;<br>Spons, Cyclop., 1042, 1S48 i Bombay Gazetteer, VI., 201.                                                                                                                                                                                                                                                                                                                                                      |                        |
| Occurrence.—This mineral is found in Persia, Bucharia, China, Siberia,<br>and Chili, and is also said to occur in Afghánistán and Biluchistdn.<br>Though not known with certainty to occur in India, it is imported into the                                                                                                                                                                                                                                                                                                                                                                                                | locality.<br>76        |
| country, where it is employed for several purposes.<br>Pigment.—True ultra-marine, composed of finely powdered Lapis Lazuli,<br>was at one time largely used in India for house-decoration and book-illumin-<br>ating. It is said to have cost, when purified, from R80 to Rioo a seer, but<br>now, as in Europe, its place has been taken by the artificially-made sub-<br>stitute, which is sold in the bazars under the same name of <i>lajward</i> for<br>some R4 a seer. In Europe, the refuse in the manufacture <i>is</i> calcined and<br>affords delicate gray pigments, known as ultra-marine ash ( <i>Ball</i> ). | pigment.<br>77         |
| Medicine.—It is employed as an astringent and refrigerant by native<br>practitioners <i>[Irvine</i> ); it is also said to be mixed with jalap and other<br>purgatives, and to be used as an external application to ulcers.                                                                                                                                                                                                                                                                                                                                                                                                 | medicine.<br><b>78</b> |
| LAPORTEA, Gaud.; Gen. PL, III., 383.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Laportea crenulata, Gaud.; Fl. Br. Ind., V., SJO; Wight, $Ic_{t}$ /.<br>[668; URTICACE-E.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 79                     |
| THE FEVER OR DEVIL NETTLE.<br>Syn.—L. GIGANTEA and LATIFOLIA, Gaud.; URTICA CRENULATA, Roxb •<br>U. GIGANTEA, Poir.; U. SINUATA, Blume; U. CHURTA, Ham.; URERA<br>JAVENSIS and GIGANTEA, Gaud.; U. CRENULATA and COMMERSO-<br>NIANA, Wedd.; DfiNDROCNIDE CRENULATA, Miq.<br>Vern.—Chorpatta, surat, BENG.; seed=Utigun ka bij, BEHAR; Mo-<br>ringi, NEP; Sir-nat, ASSAM 5 Mealum-ma, sunkrong, LEPCHA • Phevta-                                                                                                                                                                                                             |                        |
| kyee, BURM. ; Maúsa, SINGH.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| References.—Roxb., Fl. Ind., Ed. C.B.C., 657; Brandis, For. Fl., 40 <sub>d</sub> •<br>Kura, For. Fl. Burm., II., 421 / Beddome, Fl. Sylv., t.306 • Gamble'<br>Man. Tirnh., 323 ; Thwaites, En. Ceylon PL, 259; Hooker, Him. Journ<br>II., 188} Med. Top. Ajm., 148; Irvine, Mat. Med, Patna, 79; Rovle<br>Fib. PL, 366; Cross, Bevan and King, Rep. on Ind. fibres 10 KA t<br>Agri-Hort. Soc. of Ind.:—Journ. (Old Series), IV., 216; VII./222                                                                                                                                                                              |                        |
| L. 79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |

| LARIX<br>Griffithii       | The Himalayan Larch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                           | VIII., 89; X., Sel., 26; Balfour, Cyclop., II., 280; Indian Forester,<br>II., 21; XIV., 269,273.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                           | Habitat.—An evergreen arborescent shrub, met with in the Tropical Himd-<br>laya from Sikkim eastwards, also in Assam, the Khásia mountains, and<br>Perak, distributed to Ceylon and Java. It has powerfully stinging hairs,<br>contact with which causes excessive burning pains which last for several<br>days and are greatly intensified by the application of water. Beddome<br>remarks that with natives the sting often brings on fever, hence the name<br>by which the plant is known to coffee planters and other English residents.<br>Hooker states that the plant possesses this property of stinging only in the<br>autumn, a fact which appears not to have been noticed by most Indian<br>writers.                                                                                                                                                                                                                                |
| fibre.<br>80              | Fibre.—This plant yields a strong useful fibre, used by the hill tribes<br>of Assam for cordage, and in the manufacture of a coarse cloth. Major                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 80                        | Hannay, who was one of the first to bring the fibre to the notice of Europeans, stated that it was fine, white, apparently of no great strength, and by report, not very lasting. Messrs. Cross, Bevan, and King, 'however, in their recent report on Indian fibres, appear to hold a more favourable opinion, stating that the fibre " is good, is more or less allied to rhea, and, like that fibre, is very strong " On comparing the results of the chemical analyses of these two fibres, however, by the same observers, it will be found that while rhea fibre contains 803 per cent, of cellulose, that of Laportea has only 53'4 and is also very largely acted on by hydrolysis. The small percentage of cellulose would appear to indicate a very great inferiority in the latter, and this fact, together with the heavy loss it sustains lay hydrolysis, stamps the fibre as unlikely ever to become of commercial importance.     |
| Medicine.<br>Seeds.<br>81 | Medicine.— Irvine states that the SEEDS, in doses of J drachm to J oz.i are used in Patna in the same way as coriander, also that they are imported from Nepal, and are sold for 8 annas per tb.<br>Lard, see Hog, p 253.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                           | LARIX, Miller; Gen. PI., III., 44*.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                           | A genus of trees belonging to the Natural Order CONIFERS, and comprising <sup>1</sup><br>eight species, natives of North Temperate and Arctic regions. Of these only one is<br>indigenous to India. The Kuropean Larch, L. europaea, is extensively culti-<br>vated for its timber, and for ornamental purposes, in the hilly regions of Europe.<br>It yields VKNICB TURPENTINE, a substance used to a small extent medicinally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 82                        | Larix Griffithii, Hook./. & Thorns.; Fl. Br. Ind., V., 655 / CONIFER*.<br>THE HIMALAYAN LARCH.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| TIMBER.<br>83             | <ul> <li>Sya.—LARIX GRIFFITHIANA, Gord.; ABIES GRIFFITHIANA, Lindl.&amp;Gord.<br/>PINUS GRIFFITHII, Parlat.<br/>Vern.—Boargasella, NEPAL; Sak, soar, SIKKIM.<br/>References.—Brandis, For. Fl., s3i; Gamble, Man. Timb.,4W; Hooker^<br/>Him. Jour., II., 44; Balfour, Cyclop., II., 681; Kew Off. Guide to the<br/>Mus. of Ec. Bot.y 147.<br/>Habitat. — A small deciduous tree found in Eastern Nepal, Sikkim, and<br/>Bhutan, between altitudes of 8,000 and I2,coo feet.<br/>Structure of the Wood.—Heart-wood red, inner zone of each annual<br/>ring soft and spongy, outer zone narrow, firm, and shining; resinous ducts<br/>scanty, large; weight 32ft per cubic foot (Gamble). Hooker states that<br/>ne never saw the wood red. as above described, but always white and soft,<br/>til S tempt however: which Gamble holds to be incorrect. The wood<br/>per the the most durable of the coniferous tim-<br/>n into Tibet.</li> </ul> |
|                           | L. 83                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Lasia; Lasiosiphon. (7. Murray.) L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ATERITE.                   |
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| LASIA, Lour.; Gen. PL, III., 993.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                            |
| Lasia spinosa, Thwaites ; DC, Monographic Phanerogamarum, II.9<br>[272; Wight, Ic., t. 777 ; AROIDEJE.                                                                                                                                                                                                                                                                                                                                                                                                                             | 84                         |
| <ul> <li>Syn.—DRACONTIUM SPINOSUM, Linn.; POTHOS LASIA, Roxb.; P. SPI-<br/>NOSUS, Ham.; P. HEI EKOPHYLLA, Roxh.; LASIA ROXBURGHII, Griff.;</li> <li>L. HETEROPHYLLA, Schott; L. ZOLLINGERI, Schott; L. JENKINSII,<br/>Schott', L. DEHJSCENS, Schott.</li> </ul>                                                                                                                                                                                                                                                                    |                            |
| <ul> <li>3Jai. Hermanni; L. HERMANNI, Schott.</li> <li>Vern. — Kanta-katchu, BENG.; Kanta saru, SANTALI; Múlasari, kanta kachdramu, TEL.; Kohilla, mahakshilla, SING.; Zdyap, BURM.</li> <li>References.—Roxb.,Fl. Ind., Ed. C.B.C., 147; Kurz, Prelim. For. Rep. on Pegu. App. C, xix.; Thwaites, En. Ceylon PI., 336; Elliot, Fl. Andhr.,</li> </ul>                                                                                                                                                                             |                            |
| 82,* 118; Campbell, Be. Prod. Chutia Na&ur, No. 8421.<br><sup>0</sup> Habitat.—Native of India, occurring in Sylhet, Bengal, and Assam,<br>distributed to Java, Sumatra, and Ceylon.                                                                                                                                                                                                                                                                                                                                               |                            |
| Medicine.—Campbell reports that the ROOT is highly esteemed by the<br>Santals as a remedy for affections of the throat. The LEAVES and roots<br>are also used medicinally by the Singalese.                                                                                                                                                                                                                                                                                                                                        | MEDICINE.<br>Roots.<br>8 5 |
| Food.—Thwaites states that the LEAVES and ROOTS are employed as a                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ,<br>Leaves.               |
| vegetable in curries.<br>LASIOSIPHON, Fresen.; Gen. PI, III., 197.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>86</b>                  |
| LasiOSiphon eriocephalus, Dene.; Fl.Br. Ind., V., 197; Wight.,<br>[Ic, tt. 1859, i860; THYMELACE-E.                                                                                                                                                                                                                                                                                                                                                                                                                                | FOOD.<br>Leaves.<br>87     |
| <ul> <li>Syn.—LASIOSIPHON SPECIOSUS, Dene.; L. SISPARENSIS, HUGELII ?, and<br/>INSUI.ARIS, Meissn; L. METZIANUS, Miq.; DAPHNE ERIOCEPHALA, Wall;<br/>LANCHNVEA ERIOCEPHALA, Heyne; GNIDIA ERIOCEPHALA, Meissn.; G.<br/>SISPARENSIS, Gardn.; G. INSULARIS, Gardn.; G. MONTICOLA, Miq.</li> <li>Vern.—Ramatta, rametha, BOMB., Rdmita, rdmetta, MAR.; Rdmi, KAN.;</li> </ul>                                                                                                                                                         | Roots.<br>88<br>89         |
| <ul> <li>Naha, SING.</li> <li>References.— Beddome, For. Man., 179, t. 25, f. 2; Gamble, Man. Timb., 314; Thwaites, En. Ceylon PL, 250; Dalz. &amp; Gibs., Bomb. FL, 221; Dymock, Mat. Med. W. Ind., 2nd Ed., 674i Lisboa, U. PL Bomb., n3, 268; Mad. Bot. Gard. Rep. 1883-84* H&gt;; Gazetteers—Bomb., X.,403; XV., 72.</li> <li>Habitat.—A small tree or large shrub met with in the Deccan; in</li> </ul>                                                                                                                       |                            |
| Southern India, ascending to 7,000 feet on the Nilghiris; and in Ceylon,                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1                          |
| where it reaches an altitude of 4,000 feet.<br>Fibre.—The BARK yields a fibre which has been recommended as a<br>paper-making material.                                                                                                                                                                                                                                                                                                                                                                                            | FIBRE.<br>Bark.            |
| Medicine.—The BARK is a powerful vesicant ( <i>Dymock</i> ).<br>Domestic.—The LEAVES and BARK are acrid and poisonous, and are fre-<br>quently used to poison fish. In the <i>Kanara Gazetteer</i> it is stated that the<br>wood or its ash destroys the teeth, and that the natives are most careful not<br>to use it.                                                                                                                                                                                                            | багк.                      |
| Lastrea Filix-mas, THE MALE-FERN, see Ferns, Vol. III., 323.<br>LATERITE.                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 92<br>Bark.                |
| Laterite, Ball., Man. Geology of India, III., 549.<br>Vern.—Kabuk, SING.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 93<br>94                   |
| The following note has been kindly furnished by H. B. Medlicott, Esq.,<br>F.R.S., late Director of the Geological Survey :—<br>"An essentially Indian rock, to which this name (deriv. <i>later</i> , a brick)<br>was given in the first instance by Dr Buchanan, from its generally brown<br>or reddish-brown colour, and perhaps from the easy way in which it can<br>be cut or chipped into blocks of all sizes on its first quarrying. The largest<br>and best-known laterite regions are those of the Deccan, the West Coast, | LOCALITY.<br>95            |
| from between Bombay and Ratnagiri, nearly down to Cape Comorin,<br>L. 95                                                                                                                                                                                                                                                                                                                                                                                                                                                           | I                          |

**589** 

| LATHYR<br>sativus    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| LOCALITY.            | and the eastern coast of the Madras Presidency. This rock also <b>extends</b><br>up into Orissa and Midnapur, and is found in smaller and detached<br>areas all over the Peninsula, even capping the summits of some of the<br>highest hills. In Ceylon a similar rock goes by the name of <i>Cabook</i> or<br><i>Kabtk.</i><br><sup><i>u</i></sup> Wherever it occurs it is used as a building or road material, for it is                                                                                                                        |
|                      | easily dressed or broken up. When first quarried, it is generally soft and<br>of a bright red colour, but on exposure it hardens and turns a dark brown<br>colour. This peculiar property of hardening on exposure is best developed<br>in the drier areas; it being difficult, along the west coast, for example, to-<br>procure a stone which is sufficiently ferruginous in its composition to harden<br>quickly under that moist climate." For further information see "Iron,<br>PP.500, 505, 507, 509, 510; also Stones, Building, Vol. VI. v |
|                      | LATHYRUS, Linn.; Gen. PI., I., 526.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                      | A genus of annual or perennial herbs, belonging to the Natural Order<br>LEGUMiNOSiE, which comprises some 170 species, of which 7 are natives of<br>India.                                                                                                                                                                                                                                                                                                                                                                                         |
| 96                   | Lathyrus Aphaca, Linn.; Fl. Br. Ind., II., ijg; LEGUMINOS2E.<br>Vern.—Jangli-matar, musur-chúna, BENG.; Kaibu, NEPAL, J R*twah,<br>wawani-PB.                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | References.—Roxb., FL Ind. Ed. C. B. C, 566; Voigt, Hort. Sub. C&?<br>22j; Stewart, Pb. PL, 70; Jour. Bot. Tour in Hagara, &c, in you'?<br>Agri-Hort. Soc. Ind., XIV. (Old Series), 119; Aitchison, Bot. Qf<br>Afgh. Del. Com., in Trans. Linn. Soc, 2nd ser., III., Pt. /., 59 >' Atkin-<br>son, Him. Dist., 308; Agri-Hort. Soc. of Ind., Trans., IV., 82, 102;<br>Journ. (Old Series), IX., 416; Gazetteers:—NW. P., I; 80; Iv-><br>Ixxxi.                                                                                                      |
|                      | Habitat—A much-branched field weed, found throughout the plains of<br>Bengal, the North-West Provinces, Oudh, the Panjab, Hazara, Kumaon,<br>and Kashmir.                                                                                                                                                                                                                                                                                                                                                                                          |
| FODDER.<br>97        | Fodder.—It is used in many localities for cattle fodder, and is said to<br>be cultivated for that purpose near the Jumna. According to Voigt the<br>ripe seeds are narcotic, their effects being noticeable when eaten abun-<br>dantly, but when young they are perfectly harmless.                                                                                                                                                                                                                                                                |
| <b>98</b><br>FODDER. | L. imphalensis, <i>Watt, ms.</i><br>Habitat.—A new species, named as above by Dr. Q. Watt, was collected<br>by him at Myang-khong in Munipur at an altitude of 4,000 feet.<br>FodderThē plant is largely used as fodder in Munipur, where it is                                                                                                                                                                                                                                                                                                    |
| 99                   | allowed to cover the fields like a weed, after removal of the crops.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| ioo                  | L. sativus, Linn.; Fl. Br. Ind., II., 179.<br>JAROSSE or GESSE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | Vern.—Khesdri, kassur; kasdri, kasiar-tiuri, latri, HIND.; Khesari, teora,<br>kassur, BENG.; Kesari, SANTAL J Kesari, NEPAL; Kisara, chural<br>chapa, mattar, kdsa, latri, tiura, NW.P.; Kisdri, mattar, churaC,<br>karas, karil, PB.; Mattar, SIND.j Låkh, MAR.; Ldng, Guz.; Tnputi,<br>SANS.; Masang, PEKS.                                                                                                                                                                                                                                      |
|                      | References.—R <sub>0</sub> xb. <sub>t</sub> Fl. Ind., Ed. C.B.C., 566; Voigt, Hort. Sub. Cal.,<br>227 Stewart, Pb. PI., 71; DC, Origin Cult. PI., no; Campbell, Ec.<br>Prod. Chutia Nagpur, No. 9214; Pharm. Ind., 80; Pharmai og. Indica.<br>/., 489, 490; O'Shaughnessy, Beng. Dispens., 3i7; U. C. Dutf, Mat,<br>Med. Hind., 321; Murray, Pl. and Drugs, Sind, 121; Baden Powell,                                                                                                                                                               |
|                      | <ul> <li>Pr., 243; Atkinson, Him. Dist., 308, 694; Duthie &amp; Fuller, Field<br/>and Garden Crops, Pl. II., 16, Pl. xxxii; Lisboa, U. Pl. Bomb., 139,<br/>I. 152 PH Dir Noo(i3 Bomb. Pr., 120; Koyle, III. Him. Isoz., aw;<br/>Church, Food Grains of India, i32; Smith, Veterinary Hygiene, 156 i<br/>Balfour, Cyclop., I., 686; Agri-Hort, Soc. of Ind., —Transactions, I.,</li> </ul>                                                                                                                                                          |
|                      | • L. 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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| The Khesfiri Pulse. {J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ATHYRUS<br>sativus. |
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| <ul> <li>41; IV., 102; VI., 77; Journals {Old Series}, IV., seL, 130; XIIL, set., ST<sub>t</sub> 52; GazetteersBombay, II., 63; NW. P., I., 80; IV., Ixxi; NW. P., Selections, 1866, II., 265-295; Settlement ReportsPanjab, Jhang Dist., 90; Lahore, 10; Montgomery, 107; NW. P. and Oudh, Aeamgarh, 121, 123; C. P., Chanda, 81; Stocks, Rep. on Sind. HabitatAn annual herb, indigenous, according to DeCandolfe, in the region extending from the south of the Caucasus, to the north of India It has spread as a weed of cultivation from its original home. It is cultivated all over India from the northern indigenous area, through the North-West Provinces lo the plains of Bengal, and the Southern and Westerr Dravidonzias.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |
| Presidencies.<br>Cultivation.—It is grown as a cold weather crop on land which will<br>raise no other kind of pulse. Regarding the method pursued in the North<br>West Provinces, Messrs. Duthie & Fuller write : "Its cultivation is<br>commonest on very heavy clay soils, and it is frequently sown on land sub-<br>merged in the rainy season, which hardens during the cold weather almoss<br>to the consistency of* a stone, splitting up into long deep fissures. After<br>prolonged floods it occasionally offers a means of raising a cold weather<br>crop from land which would otherwise be unculturable, since it can be sown<br>broadcast on wiry ground, and is not so injuriously affected by the subse<br>quent hardening of the surface as would be the case with any other <i>rab</i><br>crop. For similar reasons it is occasionally sown in rice fields even before<br>the rice is cut, springing up between the rice stalks, and yielding a crop in<br>the spring while the rice stubble is still standing.<br>• <sup>4</sup> Its cultivation is commonest in the Eastern Districts, and is of considerable extent in that part of the Allahabad District which lies south of the<br>Jumna. It is also much grown under the name of <i>latri</i> in the Azamgarh | 10N.<br>101         |
| Districts."<br>The method employed in the Panj£b is very similar to that above detailed. New alluvial lands or the beds of <i>nallahs</i> are generally chosen, and the seed is scattered broadcast, and left to take its chance. The crop is sown in September-October, and reaped in March. Occasionally the land receives one or two ploughings, and the seed is in that case sowed by drill. When other food-grains are obtainable the crop is valued as fodder only; it is rarely threshed except for seed, though the young pods are occasionally used as a green vegetable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |
| The writer of the Settlement Report of the Jhang District states tha<br>nearly 8,000 acres were under this crop at the time at which he wrote; tha<br>the best crop he had seen was one raised on silt only a year old in Shorkot<br>and that the plant occasionally suffered severely from the ravages of cater<br>pillars which attacked the pods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ,                   |
| AREA UNDER THE CROP.—No trustworthy statistics are available of the area under Lathyrus in the Panjab, Bengal, Oudh, Madras, Assam Burma, Ajmere, or Coorg. The figures quoted below regarding the North West Provinces are unavoidably incomplete, but those regarding Bombay Sind, the Central Provinces, and Berar may be received as accurate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 102                 |
| <i>The North-West Provinces.</i> —The only available statistics (which, as above stated, are incomplete) give the area under this crop in 1887-88 as having been 56,100 acres, or more than double the average of the same statistics for the three years immediately preceding, which amounted to only 24,820 acres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | vinces.<br>103      |
| Rombay A-The returns of the Director of Land Records and Agricul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                   |

*Bombay*.<sup>^</sup>-The returns of the Director of Land Records and Agricul-ture shew the crop to be an unimportant one, and to have varied during the past few years between 32,783 acres in 1888-89 and a maximum of 57,661 acres in 1886-87. The only locality in which it is cultivated to any extent is Broach, which in 1886-87 had 48,000 out of the total of 57,661 acres.

Bombay. 104

4

| LATHYRU<br>sativus.                                               | The Khesári Pulse.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CULTIVA-<br>TION.<br>Sind.<br>105<br>Central<br>Provinces.<br>106 | Sind.—In 1888-89, <sup>twe on</sup> ty <sup>vear for</sup> which statistics are available 72,876 acres were under the crop.<br>Central Provinces.—These Provinces appear to possess the largest a under Lathyrus in all India. Thus in 1887-88 the total area under the constant was 357,883 acres, an increase of more than 100,000 acres on the <i>aver</i> area for the preceding four years, which was approximately 250, acres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Berar.<br>107                                                     | <i>Berar.</i> —The area under the crop in this region appears to be markably constant. Thus, during the past five years, it has only var some 9,000 acres from 46,500 to 53,900, the latter figure being retur for the year 1888-89.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| оп.<br>108                                                        | Oil.—O'Shaughnessy states that the oil expressed from the seeds i<br>powerful and dangerous cathartic. Church gives o''9 per cent, as<br>proportion of oil contained in the seed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| FOOD&<br>FODDER.<br>109                                           | Food and FodderAs already stated, this pea is cultivated principal<br>as a fodder, but being very cheap and easily grown it is considerably used<br>food by the poorer classes, largely so in times of scarcity. It is also used to<br>considerable extent to adulterate <i>ddl</i> from which it can scarcely be distinguished. The following chemical composition is given by Church : wa<br>io'i; albuminoids, 31*9; starch and fibre, 53*9; oil, 0*9; ash, 3*2. The m<br>rient ratio is about 1: 175, while the nutrient value is nearly 87.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Poisonous<br>property.                                            | A recent analysis by Astier has revealed the presence in the grain of volatile liquid alkaloid, probably produced by some proteid ferment, wh exhibits the toxic effects of the seeds, and the action of which is destroy by heat. The evil effects of habitual consumption of the seeds have lebeen known, and though the subject is one which has been much discuss there appears to be no doubt that continued use of this article of or has a tendency to produce paralysis. In one district of Bengal alo according to Irving, nearly 4 per cent, of the population suffered frist oxic effects in 1860. That observer went into the subject most ext sively, and found that if used occasionally and in small quantity, the rest were constipation, colic, or some other form of indigestion. But, on other hand, if freely employed, and especially without admixture with od sorts of grain, he found palsy to be a frequent sequel. Dr. Irving's rest further showed that ill-effects were more apt to occur in the rainy seas and that the great majority of sufferers were males, the proportion in cases which came under his observation being 6* 11 males to 0*59 females. During the years from 1829 to 1834 the grain formed, by a series accidents, the chief food of some of the eastern villages of Oudh, and, app rently, as a direct result, many cases of sudden paralysis of the lower eximities ensued. The circumstances which gave rise to this condition and characteristic features of the disease were carefully described by Color Sleeman, from whose account the following may be quoted :— •' In 1829 the wheat and other spring crops in this and the surround villages were destroyed by a severe hail-storm; in 1830 they were deficit from the want of seasonable rains, and in 1831 they were destroyed bight. During these three years the <i>kasdri</i> which, though not sown itself, is left carelessly to grow among the wheat and other $R^{Art}$ and given in the green and dry state to cattle, remained uninjured, a thrived with great luxuriance. In 1831 they reaped a rich crop |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 110 <i>uu</i> 015 0j 111 <i>uu</i> u.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 545                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The Khesfri Pulse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | LATHYRÜS<br>sativus.                                                                                                                                                                                               |
| became affected during<br>have lost the use of the<br>The youth of the surror<br>causes, formed the chief a<br>suffered in an equal degre<br>but no person once attack<br>affected, and my tent was<br>different stages of the d<br>this dreadful visitation.<br>of good caste and respe<br>infirmities were confined e<br>scribed the attack as comi<br>and without any warnin<br>proportion of the young r<br>is the prevailing opinion of<br>horses and bullocks which<br>lose the use of their limbs,<br>grain than in the stalk or<br>must be mo'e liable to s<br>eat it merely as they eat g<br>Again, Lisboa, comm<br>was taken up by Dr. H<br>brought him his wife, abo<br>lysis of the lower extrem<br>the cause to be, the man<br>and she was obliged to eat<br>instituted enquiries into th<br>he adds that, ' the native<br>it is cheap, thinking that to<br>consequences.''' | unding villages, in which<br>rticle of food during the ye<br>ee. Since the year 1834 n<br>ked had been found to rec<br>surrounded by great nu-<br>isease, imploring my advi-<br>Some of them were very<br>ctable families, and all sta-<br>ntirely to the joints below<br>ng on suddenly, often whil<br>g symptoms whatever, an<br>nen were attacked than of<br>f the natives throughout<br>n have been much fed up<br>but if the poisonous quali-<br>the leaves, man, who eats<br>suffer from the use of this<br>rass or hay."<br>nenting on this disease,<br>Kinloch Kirk in Upper-<br>ut thirty years old, who w<br>uities. When questioned<br>replied : ' It is from <i>kasa</i><br>at it for five months on en-<br>ne subject, which confirme<br>es know this <i>dal</i> is poison | 34; and many of the<br>nd are unable to m<br><i>kasdri</i> , from the sears 1S31 and 1S32, H<br>o new case has occur<br>over the use of the li<br>imbers of the youth<br>ice and assistance un<br>fine-looking young in<br>ited that their pains<br>w the waist. They<br>le the person was asked<br>and stated that a great<br>f the young women.<br>the country that h<br>on <i>kasdri</i> are liable<br>ities abound more in<br>a nothing but the gra-<br>food than beasts, wh<br>writes: "The sub<br>Sind. A villager<br>was suffering from pa-<br>as to what he thou<br><i>dri</i> ; we are very pa-<br>d.' Dr. Kirk hereu-<br>ed the statement; a<br>pout they eat it beca-<br>ave themselves from | hem FODDER.<br>ove.<br>ame<br>nave<br>red,<br>mbs<br>in<br>der<br>men<br>and<br>de-<br>eep,<br>ater<br>It<br>both<br>e to<br>the<br>ain,<br>nich<br>ject<br>had<br>ara-<br>ght<br>oor,<br>pon<br>and<br>use<br>its |
| has formed the subject of<br>has been found that the cl<br>the muscles of the lower e<br>In horses, paralysis of the<br>tion of the larynx resultin<br>complication which has no                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | investigations by Dr. B.<br>nief effect produced on the<br>xtremities, especially on<br>hinder extremities also ta<br>in asphyxia and death                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Suchard, by whom<br>e human subject is u<br>those below the k<br>akes place, but an af<br>n has been observed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | n it<br>pon<br>nee.<br>fec-<br>l, a                                                                                                                                                                                |
| published a number of ca<br>tions after death. The m<br>to be affected ; those of t <sup>*</sup><br>found to have undergone a<br>diminished, and the ulti<br>affection of the spinal core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ses in which he has carefu<br>uscles of the face, neck, an<br><u>c</u> e lower extremities, espec<br>J fatty degeneration, the<br>mate fibres containing l<br>d was discovered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ully observed the con<br>nd trunk were found<br>ially the abductors, v<br>transverse striae bo<br>ittle drops of oil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ndi-<br>not<br>vere<br>sing<br>No                                                                                                                                                                                  |
| Until lately it was extr<br>of this poisonous action of<br>different writers, some ho<br>large percentage of album<br>isolation of an alkaloid v<br>would seem, however, defin<br>discovery lies in the fact th<br>in properly cooked prepar<br>made at a high temperatu<br>atures or imperfectly cook<br><i>ddl</i> pasteballs & c in all                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | olding that the noxious pr<br>inous material contained is<br>which possesses the toxic<br>nitely to settle the point.<br>hat the alkaloid is volatile<br>vations of the grain, such<br>ure. On the other hand,<br>red, these cakes, or prepa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | as were entertained<br>operties were due to<br>in the seed. The re-<br>characters of the gr<br>The importance of<br>. It may not be pre-<br>n as thin pressed ca<br>if made at low temp<br>rations, such ?*scur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | by<br>the<br>cent<br>cain<br>this<br>sent<br>ikes<br>per-<br>ries,                                                                                                                                                 |

*ddl*, pasteballs, &c, in all probability retain sufficient of the principle to produce poisonous effects, if eaten during a prolonged period. 3<sup>8</sup>

| LAUN^A<br>aspleniifoli      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| • FOOD ft<br>FODDER.        | It seems probable that the volatile property of the poison may afford<br>an explanation of the apparent capaciousness of the effects of the pulse<br>on persons who habitually consume it. In any case, it is highly desirable<br>that experiments should be made for the purpose of definitely ascertaining<br>the presence or otherwise of the alkaloid in the ordinary Lathyrus diet,<br><i>chapatis, ddl</i> , curries, paste-balls, &c., consumed as food by the natives <sup>TM</sup><br>India. Should it be possible, by simple increase of heat and greater care<br>in cooking, to render this avowedly noxious food-grain, a wholesome ana<br>nutritious article of food, one of the cheapest and most easily ODainaDie<br>pulses of India might take a much higher rank than it now holds, ana<br>consequently become much more widely utilised.<br>As already stated, the effects of the pulse when given as a food to cattle<br>is similar to those observed in man. Thus, from the following extract from<br>Smith's <i>Veterinary Hygiene</i> , it would appear to have been used with dele-<br>terious results in Europe :—" The disease, arising from the use of Latnynw<br><b>sativus</b> ( <i>kisdri ddl</i> ) has been described by Messrs. Leather, and Pro-<br>fessors McCal I and Williams as affecting horses in England and Scotlana.<br>The grain is brought home to this country as ballast, and its action on<br>horses is to produce the most intense dyspnoea and roaring when put «><br>work; the appetite is not affected, and when in the stable the animal ap-<br>pears in perfect health. Several fatal cases are reported by these observers<br>whose articles in the <i>Veterinary Journal</i> and <i>Veterinarian</i> , April 1885, ang<br><i>Veterinarian</i> , November 1886, may be consulted with great advantage.<br>( <i>Conf. with</i> Cicer arietinum, <i>Val. II, 27Q.</i> )<br><b>Don</b> writes regarding its effects on other animals: "Swine fattenea<br>on this meal lose the use of their limbs, but grow very fat lying on<br>the ground. Kine are reported to grow lean on it, but sheep not, to oe<br>affeite Pigeons, especially when young, lose the power of walking ov<br>feeding on the seeds. Poultry will not readily to |
|                             | LAUNIEA, Cass.; Gen. PL, IL, 529-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| no                          | Launaea aspleniifolia, DC.;Fl. Br.Ind., III., 415; COMPOSITE.<br>Syn.—MICRORHYNCHUS ASPLENIIFOLIUS, DC.', PRENANTHES DICHOTO-<br>MA, Wall.; P. ASPLENIIFOLIA, Willd.<br>Vein.—Tik-chana, BENG.; Birmalla, SANTALI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MEDICINE,<br>Root.<br>I l l | <ul> <li>References.—Roxb %Ft. Ind., Ed. C.B.C., 594; Campbell, Ec. Prod. Ckutia Nag pur, No. 9263.</li> <li>Habitat.—A perennial herb met with in the plains of India, from the Panjdb to Assam, and southwards to the Sunderbands, Circars, Andamans, Burma, and Tenasserim.</li> <li>Medicine.—" The ROOT of this plant, along with that of uttri dudhi, pounded and boiled in mustard oil, is given as a lactagogue" (Campbell)*</li> <li>L in</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | AVANDULA<br>Stadias.       |
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| Launasa nudicaulis, Less.; Fl. Br. Ina*., HI., 416.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 112                        |
| <ul> <li>Syn.—MICRORHYNCHUS NUDICAULIS, Less.; M. FALLAX, Jaub. &amp; Spach;<br/>ZOLLIKOFERIA NUDICAULIS, BoiSS. / CHONDRILLA NUDICAULIS, Linn.;<br/>LACTUCA NUDICAULIS, Murray; L. OBTUSA, Clarke; PRBNANTHES PAT-<br/>ENS and P. DICHOTOMA, Wall.; P. OBTUSA, Ham.; P. PROCUMBENS,<br/>Roxb.; BRACHYRAMPUS OBTUSUS, DC.</li> <li>Vern.—Batthal, dudhlak, tarizha, spudukei, Pb.;.<br/>References.—Roxb., Fl. Ind., Ed. C.B.C., 593; Stewart, Pb. PI., 127;<br/>Indian Forester, XII., App., 15.</li> <li>Habitat.—A common weed throughout the plains, from Bengal and<br/>Behar to the Panj£b, ascending the Western Himálaya (in Kumaon)<br/>to 8,000 feet; found also in Sind and in the Deccan.</li> </ul> |                            |
| Medicine.—In the Southern Panjab the plant is used medicinally in <i>sharbat</i> ( <i>Stewart</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MEDICINE.                  |
| L, pinnatifida, Cos*.; Fl. Br. Ind., II., 416; Wight, III., /. 133.<br>Syn —MICRORHYNCHUS SARMENTOSUS, DC; PRENANTHES SARMENTOSA,<br>Willd.; LACTUCA SARMENTOSA, DC.<br>Vera.—Ban-kahu, JUICE = khi-khowa, SIND; Pathri, BOMB.; Almirao,                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 114                        |
| Go A.<br>References.—Dymock, Mat Med. W. Ind., 462; Murray, PL and Drugs,<br>Sind, 188; Lisboa, U. PI. Bomb., i63; Bombay Gasetteer, XV., 436;<br>Madras Man. 0/Admin., II., 27.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| Habitat.—A common plant of the sandy coasts of India from Bengal to Ceylon, Madras, and Malabar; very plentiful at Kardchi and Goa.<br>Medicine.—" In Bombay <i>pathri</i> is given to buffaloes to promote the secretion of milk " ( <i>Dymock</i> ). According to <b>Murray</b> the JUICE is used as a soporific for children in doses of half a <i>massa</i> , and is also externally applied in rheumatic affections, mixed with the oil of <b>Pongamia glabra</b> , or the juice of the leaves of Vitex leucoxylon.                                                                                                                                                                                         | MEDICINE.<br>Juice.<br>''5 |
| Agricultural Use.—In the Madras Manual of Administration it is stated<br>that this is one of the most important sand-binding plants on the coast.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | AGRICUL-<br>TURAL USE.     |
| LAURUS, Linn.; Gen. PL, III., 163.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Ŭ                          |
| A genus of the Natural Order LAURINE/Eof which none are natives of India.<br>The berries of one species, however, L. nobilis. <i>Linn.</i> , the "sweet barg,"<br>or "laurel" of the poets, is employed in medicine in India, under the name<br>of Za/tti, or habul-ghar.                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |
| Laurus Camphora, Linn., see Cinnamomum Camphora, iViw. / Vol.<br>H317-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                            |
| LAVANDULA, <i>Linn.; Gen. PI., II., 1179.</i><br>A genus of herbs or shr - <sup>u</sup> s belonging to the Natural Order LABIAT/E, which<br>comprises some 20 species, P'lostly Mediterranean. Of these, two—L. Gib-<br>SOni, <i>Grah.</i> <sup>9</sup> and L. Burrimyini, <i>Benth.</i> , are natives of India. Neither of<br>these is known to be of economic value, but Lisboa, in his <i>Useful Plants</i> ,<br>has affirmed that the latter, a highly aromatic species, might be utilised in the<br>manufacture of Oil of Lavender, a substance at present entirely imported from<br>Europe.                                                                                                                |                            |
| <ul> <li>Lavandula Stcechas, Linn.; DC. Prodr., XII., 144; LABIATJE.</li> <li>Vern.—Dhdrú, HlUD.; Ustukhućluš, alphajan, BOMB.; Ustukhućluš, ARAB.</li> <li>References.—O'Shaughnessy, Beng. Dispens., 489; Dymock, Mat. Med.</li> <li>W. Ind., 2nd Ed., 618; Pliick. &amp; Hanb., Pharmacog., 479; S. Arjun.</li> <li>Bomb. Drugs, ioo; Year Book Pharm., i8y3, 85; 187\$, 2\$9; Irvine, Mat. Med. Patna, 79; Birdwood, Bomb. Pr., 63; Sports, Encyclop.i 1423; Balfour, Cyclop., II., 687.</li> </ul>                                                                                                                                                                                                          | 117                        |

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LAVANDULA The true Lavender. vera Habitat-A fragrant herb found in the Canaries, Portugal, and Eastward throughout the Mediterranean region to Constantinople and Asia Minor. OIL. Oil.—It appears doubtful whether an oil is, or ever has been, distilled 118 from this species. Certain authors, however, affirm that it is the source ot the true oil of spike, used by painters on porcelain, and for artists' varnishes. At the present day, however, most if not all the oil of spike of commerce is derived from L. spica, *DC*, another European species. MEDICINE. Dried Plant. Medicine.—The DRIED PLANT and the FLOWERS have long been employed medicinally. Diosco.rides mentions the plant, and states that it is called 119 Stoechas, from the fact that it is found in the Steechades, a group of islands Flowers. on the south coast of Gaul. According to Sprengel it is the 'fyvov ° 120 Theophrastus. In early European medicine the flowers were known as Flores Steechados, or Steechas arabica, and held a place in the London Pharmacopoeia down to 1746. In the East the herb has also long been prized, and is frequently mentioned by ancient writers on medicine. At the present day it is a regular article of import into Bombay from the Persian Gulf. Dymock writes, "It is much used by native practitioners, who consider it to be resolvent, deobstruent, and carminative, and prescribe it in chest affections; they also think that it assists in expelling bilious and phlegmatic humours." Irvine states that it is used in Patna for the preparation of scents, and in doses of grs. 40 to § oz. in infusion as a refrigerant. According to Dymock the price in Bombay is R8 per maund of 37J ft. Lavandula vera, DC, Prodr., XII., 145. 121 References.—Pharm. Ind., 165; O'Shaughnessy, Beng. Dispens., 45<sup>8</sup>> Flück. & Hanb., Pharmacog., 476; Bent. & Trim.. Med. Pl., W > \*\*\* Book Pharm., 1879, 466; Spons, Encycl., 1423; Balfour, Cyclop., \*'-> 687; Smith, Die, 241; Kew Reports, 104. Habitat.—A native of South Europe and the Mediterranean shores, extending into Western Africa; introduced into England, where it is now extensively cultivated for the spikes of flowers from which a volatile oil is distilled. Oil.—From the herb an oil is obtained by distillation which is pale yellow OIL. with grateful odour, and bitter, aromatic taste. The characteristic pro-122 perties of the plant have been developed to an enormous extent by English cultivation and soil. But they are not equally developed, for, indeed, there are only two districts that can be said to suit the plant: these are Mitcham in Surrey and Hitchin in Hertfordshire. In the latter locality over 50 acres are annually under cultivation. The bushes are grown in rows 4 feet apart. the plants being 3 feet removed from each other; an acre so planted contains about 3,547 bushes. When about four yearr jld they yield the best otto, and are improved by keeping back the flo .ring. An acre should yield about six to seven quarts of otto. Essence o," l'avender is best prepared by distilling a mixture of essential oil of lavender with rectified spirit, in the proportions of 4 oz. of the former to 5 pints of the latter (60 over proof), with 1 pint rose water. (*Piesse on Perfumery*.) The cultivation of layender does not appear to have been attempted in MEDICINE. Oil. India except to a small extent in the Nilghiri Botanic Gardens, but there  $s^{\text{seem}}$  jr<sup>5 to</sup>  $\wedge^{e n_0 reason wn v ll} s^{n_0}$  uld not do well on the Himalaya. 123J<sup>TM</sup>cdiciae.—In the Pharmacopoeia of India three preparations are de-Spirit. 124 scribed as officinal-an OIL, a SPIRIT, and a COMPOUND TINCTURE. Of Compound Fincture. these the oil is rarely administered internally in its simple form, and is employed almost entirely for disguising the unpleasant odour of ointments and otner preparations. The spirit and tincture (diluted preparations of the oil), 125

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| The Henna Plant. ( <b>7</b> . Murray,)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | _ alba. |
| are stimulant, carminative, and antispasmodic, and are considerably used<br>in nervous and hysterical cases, incipient syncope, flatulence, and flatulent<br>colic. The dose of the spirit is 30 to 60 drops, of the compound tincture<br>30 drops to 2 drachms,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
| LAWSONIA, Linn.; Gen. PI., I., 782.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |
| [LYTHRACE^E.<br>Lawsonia alba, Lam.; Fl. Br. Ind., II., s73; Wight, III., t. 87;<br>THE HENNA PLANT, CAMPHIRE, CYPRESS SHRUB, or EGYPTIAN<br>PRIVET.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 126     |
| Syn.—L. INERMIS, Roxb.; L. SPINOSA, Linn.; L. PURPUREA, Lamk.<br>Vern.—Mehndi <sub>t</sub> mhindi, heña, HIND.; Shudi, mihidi, mendi, BENG.;<br>Manghati, muljuydtiU RIY A ; Mihndi, SANTAL ; BimrA, BHOTE; Mehndi*<br>hinna, nakrige, jbanwdr PB.; Mekendi, RAJ ; Mendi, SIND; MhendU<br>menhdi, C.P ; Mendi, mendhi, MAR. ; Medi, mendi, Guz.; Marithondi,<br>marutdnri, aivanam, TAM.; Gdranta, pachcha pedda gdranta, iveni,<br>TEL.; Gorantlu, gorante, KAN. ; Mayildnchi, marutdnni, ponta letshi,<br>daunlacca, MALAY.;Dan, danbin, BURM.; Maritondi, SING.; Mendhi,<br>kuravaka, mendikd, sakachara, SANS.; Hinnd,yorannd, ARAB. ; Hind,<br>panna, PERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |
| <ul> <li>References.—Roxb., Fl., Ind., Ed. C.B.C., 325; Brandtš, For. Fl., 238;<br/>Kure, For, FL Burm., I., §'9 &gt; Beddome, Fl. Sylv., anal. Gen., xiv.,<br/>f. 6; Gamble, Man. Timb., 200; Dalz. &amp; Gibs., Bomb. Fl, 97; Stewart,<br/>Pb, PL, 90; DC. Origin Cult. PL, i38; Griffith, Ic. PL Asiat.,t. S^O;<br/>Elliot, FL Andhr.; 62, 140; Pharm. Ind., 87; Ainslie, Mat. Ind., II.,<br/>190; O'Shaughnessy, Beng Dispens., 33r; Moodeen Sheriff, Supp.<br/>Pharm. Ind., 167; U. C. Dutt, Mat. Med. Hind., 30Q; Dymock, Mat.<br/>Med. W. Ind., 2nd Ed., 307; Flück. &amp; Hanb., Pharmacog., 30S; S.<br/>Arjun, Bomb. Drugs, S3; Murray, PL and Drugs, Sind, 144; Year Book<br/>Pharm., 187\$, 207; 1879, 213; Cat. Baroda Durbar, Col. Ind. Exhib.,<br/>Nos. 121, 122; Baden Powell, Pb. Pr. 348, 451; Atkinson, Him. Dist.,<br/>3ro; Drury, 17. PL, 275; Lisboa, U.PL Bomb., 245; Btrdwood, Bomb.<br/>Pr., 298, 344; Christy, Com. PL and Drugs, VIII., 50; McCann, Dyes<br/>and Tans, Beng., 56, 90; Buck, Dyes and Tans, NW. P., 29;<br/>Liotard, Dyes, 47; Crookes, Dyeing, 512; Wardle, Rep. on Indian Dyes.<br/>5, 30; Campbell, Ec. Prod. Chutia Nagpur, No. 8408; Mason, Burma<br/>and its People, 407, 758; Honigberger, Thirpj'five years in the East, I.,<br/>4, 167, II., 297; Ain-i'Akbari, Gladwin's Trans., I., 96, 100; II., 41;<br/>Stocks, Rep. on Sind; 8pons, Encyclop.,85*, 1424; Balfour, Cyclop, II.,<br/>690; Smith, Die, 81; Kew, Reports, 68; Simmonds, Trop. Agri, 3yo;<br/>Piesse, Perfumery, 402; Indian Forester, XII., Abb., 4; AgriHort<br/>Soc. of Ind.,—Transactions, VI., 240; Journals, {Old Series}, II., 3\$7<br/>IV., sel., 154; VI., 41 s IX., 422; XI., 268; Gazetteers i—Orissa, App<br/>VI., 179; Mysore and Coorg, I., 61; Bombay, V., 25; NW. P., I., 81,<br/>IV., Ixui; Parjdb, Shahpur, 66; Settlement Reports :—Panjdb, Delhi,</li> </ul> |         |
| <ul> <li>IV., Ixii; Parjdb, Shahpur, 66; Settlement Reports :Panjdb<sub>1</sub> Delhi,<br/>App. xxv., 271.</li> <li>Habitat.—A small, elegant, and sweetly-scented bush, cultivated commonly throughout India, perhaps wild in the Western regions, and according to Roxburgh certainly so on the Coromandel Coast. Stocks found it indigenous in Baluchistdn, and Brandis states that it is perhaps wild in Central India. De Candolle writes that, owing to the shrub being at the present day more or less wild in all the warm regions of Western Asia and Africa to the north of the equator, he finds it difficult to ascertain its original area. From a consideration of the vernacular-names in several languages, however, and particularly owing to the wide dispersion of the Persian</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |

ages, nowever, and particularly owing to the wide dispersion of the Persian word *panna*, he is inclined to the opinion that the plant first grew on the borders of Persia, and that its use, as well as its cultivation, probably spread from that region west into Africa and eastward to India. This opinion would appear to be supported by the fact that the use of the dye as a cosmetic, in India at least, is evidently of Muhammadan or Western origin.

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| LAWSONIA<br>alba.        | Cultivation of the Henna Plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| CULTIVA-<br>TION.<br>127 | Cultivation.—The henna plant is commonly cultivated in all the prov-<br>inces of India, partly for the sake of its dye and fragrant flowers, partly<br>as a hedge plant. The following account by Major Oavies of its cultiva-<br>tion in Shahptir, may be quoted From Baden Powell's <i>Panjáb Products</i> , as<br>descriptive of the method which 19 likely to produce the greatest amount of<br>dye:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                          | dye:—<br><sup>w</sup> The soil is prepared by repeated ploughings, not less than sixteen,<br>and heavy manuring. Before sowing, the seed is allowed to soak, in water<br>for twenty-five days. It is then spread on cloth and allowed to dry par-<br>tially. The plot of land in which it is proposed to grow the <i>rnendhi</i> is then<br>formed into small beds, and some days before sowing these are kept flood-<br>ed. The seed is scattered on the surface of the water, and with it sinks<br>into the ground. For the first three days after sowing, water is given regu-<br>larly night and morning, after that only once a day. The young plant first<br>shows above ground on the fifteenth day, after which water is only given<br>every other day for a month, when it is supplied at intervals of three days, and<br>this is continued for another month, by which time the plants have become<br>nearly two feet high. They are now fit for transplanting. The mode of<br>conducting this operation is as follows :—The young plant on being taken<br>out of the ground is reduced by nipping off about six inches from the cen-<br>tre shoot. After having been subjected to this treatment, the young<br>plants are singly put into holes, previously dug for them, at distances of<br>about a foot from each other. They are then watered daily until they<br>have recovered the shock of transplanting, and afterwards, as they may re-<br>quire it. The fields are weeded regularly once a month. The first year<br>nothing is taken from the plants, but after that they yield, for years without<br>intermission, a double crop. At each cutting, about nine inches is taken<br>from the top shoots of the plants. The two crops are got in <i>Baisakh</i><br>(April and May) and <i>Katak</i> (October and November) of each year. |
|                          | "The labourers employed in planting out the <i>mendhi</i> are liberally fed as<br>long as the operation lasts, and a distribution of sweetmeats takes place<br>when it is over. The season for sowing is during the month of <i>Baisakh</i> ,<br>that of transplanting, <i>Saivan</i> (July and August). A year's produce of an<br>acre of well-grown <i>mendhi</i> is twenty maunds of dry leaves, of which about<br>six maunds are gathered in the spring, and the rest during the autumn<br>months, and the same plants continue to yield for twenty or twenty-five<br>years <sup>*</sup><br>"The selling price of the leaves averages a rupee for twelve seers, so<br>that the value of the crops per acre is about R66. After the first year the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ļ                        | expenses of cultivation do not much exceed those? of other crops. The pro-<br>duce of the <i>mendhi</i> grown in this district is nearly all carried across the<br>Ihelum and sold in the northern districts, none of it finds its way to the<br>south."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                          | Sind.—Reports from district officers inform us that in the Surat and<br>Hyderabad districts it is grown in gardens as a hedge, the leaves being<br>used for the dye. In the Shikarpur district it is also cultivated, the profit<br>accruing therefrom being estimated at 50 per cent. On every 100 square feet<br>of soil two seers of seed are sown in February. The seed germinates in about<br>en or twelve days; when a foot high, the plants are transplanted and in<br>our months the crop is fit to yield its leaves for dyeing. The average<br>quantity of dye produced in Shikarpur is said to be 5,000 maunds, of<br>which LDOO maunds are consumed locally, and the rest is exported to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| W. Pro-<br>vinces.       | Sukkur and other places.<br><i>Bengal</i> and the <i>North-West Provinces</i> *—Henna is quite as common in hese provinces as elsewhere, and, according to Gamble, is occasionally ound in cultivation in the Terai.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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| - <u></u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Henna as a Dye.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>(7.</b> Murray,)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | alba,                                                                       |
| a hedge plant, and also occ<br>garding the area under culti<br><b>Dye.</b> —A decoction of the<br>the colour produced being<br>as malagiri. It is also emp<br>putana for dyeing handke<br>sent fot report by the Gove<br>follows:—<br>"These leaves, said to p<br>on silk by my methods after<br>sent may not have been a<br>by no blackening of the co<br>colour produced on unblead<br>any of the others where a n<br>seems to be very artistic.<br>tannin " is at variance with<br>fact that would tend to com<br>may not have been a good<br><b>Dr. G. Watt</b> (Selection<br>India, Revenue and Agria<br>Indigo-planter recently in<br>large scale, with the leaves<br>dye, isolated in the same v<br>in connection with the red<br>from Bixa Orellana, and we<br>export from India to China<br>the natives of India are, or<br>cake-dye similar to Indigo, | vation nor the degree of<br>the LEAVES is occasionall<br>a shade of yellowish of<br>ployed in combination we<br>erchiefs of an almond<br>ernment of India to Mr.<br>roduce a red colour, only<br>re repeated trials; it is p<br>good one. They posse<br>lour with an iron salt. "<br>ched Indian <i>tussar</i> with<br>nordant was used. Wh<br>" Wardle's statement<br>a the published results<br>firm his own suspicion<br>one."<br>as from the Records from<br>cultural Department, "<br>formed him that he was<br>of this plant, in the pr<br>vay as indigo. This rer<br>dye described by How<br>hich at one time formed<br>. No evidence, howeve<br>have ever at any trite b<br>prepared from Lawson<br>ant use of <i>Henna</i> in In<br>turies, is as an article of<br>e fingers, nails, hands,<br>on of henna for the form<br>own by ancient mumm<br>g Muhammadan wome<br>and by Hindus. To dy<br>d with catechu or lime, an<br>hands and feet the leaves<br>he hair the following are<br>erger: •• Of Lawsonia a<br>of dried myrtle leaves<br>hade into powder &nd m<br>tice, which is applied t<br>ulates the growth of t<br>s its splitting. The sec<br>r years in India and in P<br>s (who are extremely f<br>st preparation for the pr<br>water into a soft pap, an<br>hand fastened up with leaves<br>have all the hair is comp<br>and fastened up with leaves<br>having been suffered to<br>ation is then washed of<br>ed colour; which colour | atistics are available re-<br>utilisation of the leaves.<br>y used in dyeing cloth,<br>r reddish-brown known<br>with other dyes in Raj-<br>colour. Samples were<br>Wardle, who wrote as<br>y produce a grey colour<br>robable that the sample<br>set no tannin as shown<br>There seems to be more<br>but a mordant than on<br>at there is of the colour<br>that " they possess no<br>of chemical analysis, a<br>that " the sample sent<br><b>m the Government of</b><br><b>i., 56) mentions that an</b><br>as experimenting, on a<br>reparation of a reddish<br>mark is of great interest<br>e as similarly prepared<br>an important article of<br>er, appears to exist that<br>been, acquainted with a<br>ia alba.<br>ndia, as it has been all<br>of the toilet, the leaves<br>and feet, and for dye-<br>ner purpose dates from<br>ties and paintings. In<br>en, and is also adopted<br>e the nails the freshly-<br>nd applied to the fingers<br>are simply rubbed over<br>e the recipes principally<br>and emblic myrobolans<br>ixed with water to the<br>o the hair. It is stated<br>he hair, blackens that<br>ond recipe is one which<br>ersia, and it is generally<br>ond of possessing fine<br>urpose. The powdered<br>and applied in that state<br>letely overspread to the<br>aves, or by a piece of<br>remain for from half an<br>f. The effect of this is | CULTIVA-<br>TION.<br>Madras and<br>Bombay.<br>131<br>DYE.<br>Leaves.<br>132 |

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" The second application is a paste prepared with water from the powder

| LAWSONIA<br>lba                             | Medicinal Properties of the Henna Plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| DYE.                                        | of the indigo plant before mentioned ; it is used in a similar manner to the<br>first but must be allowed to remain on the hair for three hours; being the<br>washed off, the operation of dyeing is completed, and the hair is rubbe<br>with oil or pomatum, to give it lustre and suppleness. The only incor-<br>venience of the processes I have described, which are so cheap in the Eas-<br>is that they require to be repeated about once a week, for, as the hair grow<br>from the roots, it would otherwise, after a few days, show at that part the<br>natural colour of the hair, and consequently present a very unsightly ap-<br>pearance. These operations are generally performed at noon, a time whe<br>every one is at home either for rest or indoor occupation."<br>By certain classes of Muhammadans the process is stopped at the first<br>stage, leaving the hair and beard of a brilliant red colour, and in Persia<br>Arabia, and Northern India, the manes and tails of horses are freqt#n <sup>th</sup><br>dyed red by a similar process.<br>Oil.—The SEEDS yield an oil of which little is known; the FLOWERS are |
| OIL.<br>Seeds.<br>133                       | used in perfumery and embalming, and a fragrant otto ( <i>mehndi</i> ) isdistille<br>from them in Benares, Lucknow, and other localities. In Spons* Encycl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Flowers.                                    | pcedia it is stated that this otto is " remarkably and delightfully fragrant.<br>Olivier states that a fragrant water distilled from the flowers wa<br>known to the Jews, and was employed in baths, and as a perfume in religio"<br>ceremonies, such as marriage, circumcision, and the feast of Courbar<br>Bieram. The ancient Egyptians made a similar use of the flowers for<br>the purpose of perfuming the oils and ointments with which they anointer<br>the body, and for embalming.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| MEDICINE.<br>135                            | Medicine.— <i>Henna</i> has been employed a''d esteemed as a median<br>from the remotest times. It was used by the Egyptians as an astringen<br>Dioscorides mentions it under the name of <i>Kvirpos</i> . Pliny says that the<br>most esteemed cypress of Egypt comes from Canope, on the banks of the<br>Nile; the second from Ascalon in Judxa; and the third from the island of<br>C)prus. Prosper Alpinus also makes reference to the drug, stating the<br>invalids procure ease by inhaling the perfume of the flowers, and the<br>applying them to the forehead. Avicenna compares the properties of<br><i>henna</i> with those of dragon's blood, and states that its leaves possess the<br>same property of curing ulcers, and that a decoction of them is employed in<br>cases of inflammation and burns, and as a remedy against ulcers of the<br>mouth.                                                                                                                                                                                                                                                                         |
| Leaves.<br>I36                              | In India <i>henna</i> is much esteemed by Muhammadans, indeed, a trad<br>tion exists that their prophet spoke of it as <i>syyadu ridhm=the</i> best of herb<br>Arabic and Persian writers describe the LEAVES as a valuable extern<br>application in headache, combined with oil so as to form a paste, to whic<br>resin is sometimes added. "They are also applied to the soles of the fe<br>in small-pox, and are supposed to prevent the eyes being affected by the<br>disease. Applied to the hair and nails, as already described, they have the<br>reputation of promoting healthy 'growth. An ointment made from the<br>leaves is said to have valuable healing properties, and a decoction is use                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Bark.<br>137                                | as an astringent gargle. The BARK is given in jaundice and enlarg<br>ment of the spleen, also in calculous affections, and as an alterati-<br>in leprosy and obstinate skin diseases; in decoction it is applied to burn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Seeds.<br><sup>B</sup> 8<br>Flowers.<br>139 | scalds, &c. The SEEDS, with honey and tragacanth, are described a cephalic. An infusion of the FLOWERS is said to cure headache and to a good application to bruises; a pillow stuffed with them has the reput tion of acting as a soporific. An ointment is also used as an extern application to bruises * (Dymock). Ainslie states that in Southen Ind the <i>Lytians</i> " prepare a kind of extract from the pale-yellow, strong-sme ing flowers, as also from the leaves and tender shoots, which they consid as a valuable remedy in cases of lepra and other depraved habits of the tender shows.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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| Medicinal Properties of the Henna Plant (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | aiba.             |
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| body; prescribing it in the quantity of half a tea-spoonful twice in the<br>twenty-four hours." Dymock remarks that " in the Konkan the leaf juice<br>mixed with water is given as a remedy for spermatorrhoea, and with milk<br>in the condition popularly known as' hot and cold fits."" <i>Henna</i> occupies a<br>place in the non-officinal list of the Pharmacopoeia of India, where attention<br>is specially drawn to its use in "that obscure affection termed 'burning<br>of the feet' often met with in India." Dr. Grierson is quoted as mention-<br>ing an obstinate case benefited by the use of the leaves, and it is stated that<br>"the editor, when in Burma, witnessed, in some cases, a great amount of<br>temporary relief to the distressing sensation of burning, from this remedy,<br>when numerous other means had previously failed. The fresh leaves<br>beaten up into a paste with vinegar and applied as a poultice to the soles<br>of.'he feet, was the common mode of application, but some patients obtained<br>greater relief from using strong frictions with the bruised leaves over the<br>part. Like all other remedies, however, they not unfrequently fail to<br>afford more than temporary relief."<br>It may be of interest to note that Honigberger mentions a use of this<br>plant not dealt with by other writers. Remarking on a severe attack of<br>rheumatism from which he suffered in Greece, he writes, "Amongst the<br>many remedies which I applied, Lawsonia inermis proved the most effec-<br>tual. Every evening before going to bed, I applied to the affected part<br>the pulverized herb, with as much water as was sufficient to make a soft<br>poultice. In the morning I washed it off, but the place continued red;<br>it is the same herb with which the fair sex in the" East stain their hands<br>and feet."                                                                                                                           | MEDICINE.         |
| CHEMICAL COMPOSITION.—The only chemical substance of medicinal value known to be contained in <i>Henna</i> leaves is an astringent principle. Berthelot supposed them to contain gallic acid; later investigations l.y M. Abd-el-Aziz Herraory have shown that the colouring matter consists of a sort of tannin to which he gave the name of <i>Hennotannic add</i> . Dymock, quoting from <i>Journal de Pharmacie, January 18639</i> writes:" This principle is brown, of a resinoid appearance, and soluble in boiling water* It possesses the properties of tannin, such as blackening the sesqui-salts of iron, and precipitating gelatine. It reduces oxide of copper in Trommer's test, and heat decomposes it, with the production of crystalline needles which reduce nitrate of silver." SPECIAL OPINIONS.—§ " A decoction of <i>mendhi har</i> and <i>hath</i> is used for gonorrhoea as an injection ( <i>Surgeon-Major C. W. Calthrop, M.D., Morar</i> ). " The fresh leaves, beaten into a paste with vinegar or lime juice, are said to be useful in cases of burning of the feet'" ( <i>Civil Surgeon J. H. Thornton, B.A., M.B, Monghyr</i> ). " A poultice of the fresh leaves has a soothing effect when applied to swollen and painful parts; it is also used to harden the skin of newly healed wounds" ( <i>Civil Surgeon J. Anderson, M.B., Bijnor, North-Western Provinces</i> ). " An infusion made from the leaves has been found particularly useful in cases of scurvy and ulcers of all kinds. In cases of ulceration of the mouth, it is a valuable remedy, used as a gargle " ( <i>Civil Surgeon F F. Perry, Jullundur City, Panjdb</i> ). "In Belgaum the seeds are called <i>isbon</i> and are considered useful in delirium. They are given internally" ( <i>C. T. Peters, M B., Zandra, South Afghanistan</i> ). "'The leaves, both dry and green mashed with water and applied to the body, relieve prickly heat." ( <i>Surgeon-Major A.S.G, fayakar, Muskat</i> ). | Chemistry.<br>140 |
| Juyukur, Muskur).<br>Structure of the Wood — Crev bard close-grained used for tool band-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TIMPED            |

Structure of the Waod.—Grey, hard, close-grained, used for tool hand-les, tent pegs, &c.

Domestic—This handsome shrub has always been a favourite garden plant in the East from the times of the ancient Egyptians to the present

TIMBER. I4X DOMESTIC. 142

| LEAD.            | Lead.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| DOMESTIC.        | day. Thus Solomon writes, "My beloved is unto me as a cluster of<br>camphire in the vineyards of En-gedi." The use of the otto by the<br>Jews has been already referred to, and they also had a custom, ?<br>sprinkling the flowers on the garments of the newly-married. In India it<br>is much cultivated as a garden plant and for hedges, and is held in parti-<br>cularly high esteem by Muhammadans, who consider its flowers amongst<br>the most suitable with which to compose a posy to be presented in token<br>of esteem and honour. The utilisation of the otto and dye for domestic<br>purposes has already been described.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                  | LEAD, Ball, in Man. Geology of Ind., Ill, 281-311.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                  | This metal rarely occurs anywhere in the metallic or native state, <sup>an&lt;</sup> ?- <sup>a</sup> J?" pears never to be found in this condition in India. Its commonest ore is tje sulphide, or galena. Many of the other ores are of little interest save to tne mineralogist, but bournonite or antimonial lead, cerussite, or the carbonate, pyromorphite or phosphate, mimetite or arsenate, and crocoisite or chromate, are all of economic importance. Many compounds of lead which do not occur abundantly in nature, but which are extensively used in the arts for pigments, dyeing, glass-making, medicine, & c, are artificially prepared.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 143              | Lead) Mallet, Man. of Geol. of India, IV. {Mineralogy), 6, lj><br>Venu—The Metal :-Sisa, sisu, shUh, HIND.; Sisd, b&ndi, BENG.;<br>Sisha, surb, PB.; Shish, DEC.; Ikam, exam, TAM.; Shishum, sheshumu*<br>TEL.; Temaétam, MALAY.; Khai-pok <sub>2</sub> khai-ma-pok, BURM.; Stsam<br>SANS.; Anúkjrassds, ARAB.; Surb, PFRS.<br>The Oers and Salts :>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                  | <ul> <li>I. GALBNASurmaV<sup>1</sup> krishna surmå, HIND.; Anjana, sanvirdnjana, SANS.</li> <li>II. RED OXIDE OF LEAD.—Sandklir, ingur, HIND. &amp; PB.; Sindur, DEC. Segapy, senduerum, turn sindlirttin, TAM. r Yerra sinduram. i,SL;, mamera, sadda Ian gam, gamaggam, MALAY.; Wsang, BURM.; W dura, SANS.; Isrenj, ARAB.</li> <li>III. LITHARGE.—Murdasang, HIND. &amp; PB.; Marudar singhie, TAM., IV. CARBONATE OF LEAD.—Safeda, HIND. &amp; PB.; Vullay, muthu Suffy, TAM.; Sibaydu, TEL.; Tima-putih, MALAY.; Asfiddj, ARAB.; PERS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| locality.<br>144 | <ul> <li>V. CHROMATE OF LEAD.—Peori-wilayti, HIND.</li> <li>References—Forbes Watson, Indust. Survey, 11., 406, 407 ; Baden Powelly, Pb. Pr., u, S4, 63, 102, 114, us; Mason, Burma and Its People, 5^729 ; Abul Fail, Ain-i-Akbari {Blochmanri's Trans.}, 40 ; Atkinson, Hi*;; Dist.,290; Pharm. Ind., 360-364; A ins lie, Mat. Ind., /., S32-S37 j<sup>u</sup> ' £ Dutt, Mat. Med. Hind., 72, 73; Irvine, Mat. Med. Patna, ^/ %f f' Dyeing and Calico-Printing, i\$2, 154, 541; Gazetteers—Panjāb, a*an: pur, 13; Settlement Reports:—C. P. Maipore, 7; Panjdb, Derabna**; Khan, 7; Dist. Man—Madras, Cuddapah, 26, 27; Madras, Man. qj Admin., 11., App. <w></w><w></w></li> <li>Worked in India, Ball states that there is probably no metal of which the ores have been worked to so large an extent in ancient times, excepting those of iron. This is testified to by the number of, old mines in Southern India, Rajputana, Baltchistan, and Afghanistan It is possible that in some at least of these cases the galena may have been chiefly worked for the silver which it contained. Ball states that ores of lead are found in Peninsular India, in the rocks of metamorphic, submetamorphic, and lower Vindhyan ages only; but that in the extra-peninsular area they occur in, at least, one younger formation, namely, in the cretaceous rocks of Balutchistan.</li> </ul> |
|                  | L. 144 (• Confused with antimony-)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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| Localities in which Lead occurs. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | LEAD.                                                   |
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| As the working of lead ores in India is at present exceedingly unimport-<br>ant and precarious, it does not appear to be necessary to enter into a full<br>account of the localities in which they are to be found. For such informa-<br>tion the reader is referred to the long and exhaustive account by Ball ( <i>loc.</i><br><i>cit.</i> ). The following short description of the principal localities kindly fur-<br>nished by Mr. Medlicott ( <i>late Director of the Geological Survey</i> ) may-<br>suffice for the purposes of this work :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LOCALITY.                                               |
| "At Jungamrazpilly or Baswapur, in the Cuddapah district of Madras,<br>argentiferous galena occurs and was formerly very extensively worked, but<br>the workings have been long deserted. Gazalpully, or Baswapur, in the<br>Karnúl district, is also another locality for similar ores. Deposits of galena<br>containing silver occur in the Bhaugulpur district, and have been more or<br>jess worked at various times. There are some galena deposits, rich in<br>silver, at Dhadka in the Manbhúm district. In the Central Provinces, lead<br>ores have been found in Sambalpur at Falpuchia, Zhunan, and Pad am pur,<br>and in Raipur at Chicholi. In Rájputana, galena occurs and has been<br>mined for in Ajmir, Alwar, and Udaipur. In Balúchistán there are ancient<br>lead mines at Sekran of considerable extent, but long deserted. In the<br>Panj£b argentiferous galena occurs at Manikaru in the Kulu district.<br>Lead mines and works were started a few years ago near Subathu in the<br>Simla district, and mines have been for long worked by natives in Sirmur." |                                                         |
| Dye and Pigment.—The RED OXIDE OF LEAD or red lead is largely<br>used as a pigment. It is made in certain jjarts of the country by exposing<br>melting lead to a stream of air, and is also imported. It is not only largely<br>employed for painting and decorating, but is also used for religious pur-<br>poses by the Hindus, who make marks with it on their idols, and on their<br>money at certain seasons for good luck. Boulders may frequently be seen<br>in the Himálaya marked with a patch of red lead, which is supposed to<br>convert them into idols or objects of worship. All married Hindu women<br>employ red lead as a paint for the forehead.                                                                                                                                                                                                                                                                                                                                                                                                                   | DTE ft<br>PIGMENT.<br>Red Lead.<br>145                  |
| The yellow CHROMATE OF LEAD or <i>peori-iailayti</i> , so called from its resemblance to the Hardwari <i>peori</i> , is imported from Europe. It is used in dyeing and as a pigment for all shades of yellow, from the palest primrose to deep orange chrome; and is also considerably employed in calico-printing, the colouring material being formed in the cloth. The process employed is described by Crookes as follows: "24 ozs. of white sugar of lead (acetate) are dissolved in each gallon of water and thickened with 4ft of gum. The solution is printed on the cloth which is then dried and passed for two minutes through a cold bath of bichromate of potash and common salt, containing 6 ozs. of bichromate of potash and 24 ozs. of salt to the gallon. The cloth is finally well washed and dried." By this means yellow chromate of lead is precipitated in the fibres of the cloth. By slightly varying the chemical process different shades are obtained, and the process is applicable to yarns as well as to cloth.                                        | Chromate.<br>146                                        |
| The ACETATE and SUBACETATE are occasionally employed as mordants<br>and for the production of lakes, but the colours obtained are inferior, and<br>are apt to blacken in the presence of sulphur. A lead mordant is, how-<br>ever, in common use for fixing aniline purple and mauve.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Acetate.<br>147                                         |
| NITRATE OF LEAD is employed in mixing murexide purple, and it, as well<br>as the SULPHATE, may be used instead of the acetate for producing chro-<br>mate of lead in cotton goods.<br>PLUMBITE and PLUMBATE OF SODA are also occasionally similarly<br>employed.<br>WHITE LEAD (the CARBONATE) is employed largely as a ground colour,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Nitrate.<br>I48<br>Sulphate.<br>149<br>Plumbite.<br>150 |
| and as a> white paint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | White Lead.<br>151                                      |
| а т 151                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                         |

| LEAD.                | Various uses of Lead.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| medicine.<br>152     | Medicine.—The monoxide or litharge (PbO.), the carbonate, acetate<br>subacetate, nitrate, and iodide are officinal in the Indian Pharmacopoeia<br>All these salts, except the acetate, are employed externally only, as sedative<br>and cooling astringents, in various skin diseases. The acetate is similarly<br>used, but is also administered internally as an astringent and haemostati<br>The properties and applications of the officinal salts are too well known to<br>require further description.                                                                                                                                                                                                                                                                                                                            |
|                      | Preparations of lead have long been similarly employed, and valued m<br>Indian medicine. Thus U. O. Dutt states that the Sanskrit name for Galen<br><i>—anjana</i> —literally signifies " <i>the</i> collyrium," and was applied to the sub<br>stance, owing to the fact that it was considered the best medicine for the eyes.<br>It is largely used at the present day as an application to the eyes, and is sup<br>posed to strengthen the sight, improve the appearance of the eyes, a~d P <sup>re</sup>                                                                                                                                                                                                                                                                                                                            |
|                      | serve them from disease. In ophthalmia, blepharitis, and allied diseases o<br>the conjunctiva it is prescribed in various preparations. U. C. Dutt describe<br>two of these as follows:—(i) Galena is heated over a fire, cooled in a d*j <sup>coc</sup><br>tion of the three myrobolans for seven times in succession, then rubbed up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | with human milk. (2) To one part of purified and melted lead, add at<br>equal proportion of mercury and two parts of galena, rub them all togethe<br>emu LCUULC IU puwucr. nuw aua campnor, equal in weight 10 um^*"<br>part of the mass, and mix intimately. {Mat. Med., Hindus.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                      | Metallic lead purified, by pouring the molten metal into the milky juic<br>of Calotropis gigantea, is also employed in Sanskrit medicine. It is re-<br>duced to powder by again melting it in an iron cup, adding to it one<br>fourth part of its weight of <i>yavakshara</i> (impure carbonate of potash) and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                      | powdered tamarind shells, and agitating with an iron rod till the mass<br>is reduced to fine powder. The preparation thus produced consists of an<br>impure carbonate of lead. It is supposed to be a valuable remedy in vari<br>ous forms of urinary disease. A lead probe is preferred for the application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                      | of collyria to the eyelids.<br>Litharge is unknown in Sanskrit medicine, but is said by Ainslie to bused by the •• Tamools '' for the preparation of certain <i>kdlümbús</i> or plasters and to be placed by the Arabs amongst their anodynes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| OMESTIC &<br>SACRED. | Red lead is described in Sanskrit medicine as useful for external appli<br>cation in cases of eruptive skin diseases. It is applied in the form of an<br>oil, or liniment, and mixed with black pepper and butter as an ointment.<br>Domestic and Sacred.—The ordinary industrial uses of lead and its salt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 153                  | require no comment. The metal is comparatively little employed by the<br>natives of India owing to its scarceness. Red lead is, as already stated<br>used to a considerable extent as a pigment for several religious purposes.<br>Galena is employed not only as a medicinal application to the eyes, but<br>also as a cosmetic in the place of antimony. It is also utilised to a con-<br>siderable extent for glazing pottery.                                                                                                                                                                                                                                                                                                                                                                                                       |
| TRADE.               | Trade.—No statistics can be given regarding the inland trade in lead<br>since it is not sufficiently important to be returned separately. The import                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Imports.             | trade from foreign countries is, however, considerable, having amounted, in the year under consideration to 113 130 cwt, valued at R 15 88 631                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 154                  | the year under consideration, to 113,130 cwt., valued at R 15,88,631. J <sup>1</sup> addition Government imported 49,285 cwt., valued at R4.62,535. The trade has also increased very considerably during the past ten years. Thus, during the five years ending 1883-84, the imports (private) averaged 70,758 cwt., valued at R10,05,1,6, while in a similar period ending 1888-89 wood we do 100,256 cwt., valued at R12,63.241. This increase of about 30,000 cwt is believed to have been almost entirely caused by a development of the tradefine time for tea-chests, the imports of which have increased in S e ${}^{3} \wedge {}^{5} \wedge {}^{4} + {}^{1} 2$ ${}^{1883 \times 84 \times 10}$ ${}^{661 \times 15}$ cwt. in 1888-89. The imports in the other descriptions enumerated in the trade returns, <i>vie.</i> , pig. |

Leather.

| wear and tear. The final result of the processes ordinarily employed is a   |
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| chemical combination of certain constituents of the skin with tannin. Two   |
| other processes are, however, occasionally followed, by one of which "tawed |
| leather" is produced, through the action of mineral salts, by the other     |
| " shamoyed leather " is formed, in which the skins are combined with oils   |
| or fatty substances.                                                        |
|                                                                             |

(J. Murray.)

Vern.—Charmo, chatnra, HIND.; TOI, TAM.; Kulit, balulang, MALAY.; Charm, PERS.

**References,**—5W. from Rec. Gout. of!nd.oR. & A. Drpt., /., 83-111\$ Baden Powell, Pb. Prod., 156; Pb. Manuf., 121-136; Balfour, Cyclop. II., 693; Ure, Diet. Indus., Arts and Manu., II., 836; Gazetteers:— Bombay, IV., 139; Peshawar, 149; Hoshiarpur, u3; Gurdaspur, 61; Shahpur, 78; Settlement Rep., Kohat, 127.

The Natives of India have long been acquainted with the methods used in tanning, though it is very doubtful if they have ever made leather of superior quality. They employ for this purpose the hides of the buffalo, bullock, and cow, also the skins of goats and sheep. For an account of these the reader is referred to the article on Hides, pp. 248-251; also to that on Skins. Vol. VI.

The following note by Captain John Stewart, R.A., on the methods pursued at the Government Tannery, Cawnpore, may be reprinted from the Records of the Government of India, Revenue and Agricultural Depart156

Re-exports. 155

ore, and various kinds of wrought lead other than sheeting for tea-chests, TRADE. Imports.

ore, and various kinds of wrought lead other than sheeting for tea-chests, have remained comparatively steady. The imports on account of Government have increased from an average of 6,854 cwt., valued at R60,769 in the quinquennial period ending 1883-84, to 17,099 cwt., value R 1,98,220 in that ending 1888-89 (the figures of weight are defective, those of value accurate). The amount of the metal im-ported, however, fluctuates very erratically year by year, and consists almost entirely of pig lead for ordnance purposes.

annost enurely of pig lead for ordnance purposes. The greater part of the general imports comes from the United King-dom. Thus in the year under consideration the sources of supply were as follows:—The United Kingdom, 04,262 cwt.; France, 15,788 cwt.; Italy, 2,111 cwt.; Belgium, 825 cwt.; Ceylon, 97 cwt.; and other countries 47 cwt. The shares of the seaboard presidencies and provinces in the imports were—Bengal, 76,407 cwt.; Bombay, 30,023 cwt.; Sind, 3,415 cwt.; Madras, 2,339 cwt., and Burma, 946 cwt. RE-EXPORTS —With the increase in imports a corresponding in the increase.

RE-EXPORTS.—With the increase in imports a corresponding increase has taken place in the re-export trade, which is, however, very unimportant. In the five years ending 18^3-84 it averaged 2,658 cwt, value 829,707, while, in a similar period ending" 1888-89, it averaged 3,962 cwt., value £39,136. Nearly the entire trade is in pig-lead. In 1888-89, the whole re-export amounted to 5,095 cwt., value 656,330, of which 1,612 cwt. went to Arabia; 1,272 cwt. to Turkey in Asia; 899 cwt. to China; 690 to Persia, and un-important quantities to other countries. Nearly the entire export was from Bombay.

LEATHER.

Leather consists of hides and skins of certain animals, separated from fleshy and fatty matters and prepared by means of chemical agents in such a way that they resist the influences to which they are naturally subject. Skins in their fresh state are tough, flexible, and apparently well suited for clothing, &c.; but on drying they become hard, horny, pervious to water, and finally putrid. These changes are prevented by the processes of the leather manufacturer, and at the same time the skm is rendered stronger, more impermeable to water, more supple and less likely to be affected by

LEATHER.

| LEATHER.                                                                                                                                                                                    | Methods Of Tannins:.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                             | ment, as it gives a full and interesting account of the processes most likely<br>to give good results with Indian hides*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TANNING.                                                                                                                                                                                    | TANNING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Buildings.<br><b>157</b><br>The Tannery.<br><b>158</b><br>Lime pits.<br><b>159</b><br>Bark taps.<br><b>160</b><br>Spenders.<br><b>161</b><br>Tan pits.<br><b>162</b><br>The Currier's shop. | BUILDINGS.—" The TANNERT consists of a large building, in the floor, o<br>which are masonry pits plastered with chunam. The floor is on two level.<br>The lower contains the BEAM-HOUSE and LIME-PITS, where the hair an an a<br>of hides are removed by the action of milk of lime; also the BAR^-TAPS ai.<br>• SPENDERS ' where the bark is infused. The latter are large masonry P.<br>with false bottoms of wood, through which the infusion drains ott <sup>Dy</sup> P <sup>I</sup> "*<br>holes into a well adjoining, where a pump is fixed, and the Hq <sup>u</sup> <p sit<br="">raised and carried into the tan-pits on the higher level j these ares.<sup>TM</sup>f F.<br/>in which the hides are " tanned *' and they drain off into the spenders ai<br/>taps on the lower level</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 163<br>HIDES.                                                                                                                                                                               | nished with wooden tables for setting out and "dubbing" the niterative<br>which are hung up to dry on battens suspended from the roof,<br>are arrangements for hanging the hides on both stories.<br>"HIDES.—The hides and skins tanned and curried are—buffalo, Pullock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Raw<br>material.                                                                                                                                                                            | and cow, and goat and sheep skin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 164                                                                                                                                                                                         | and adjacent towns and cities. They are either green, direct *****                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Buffalo Hides.                                                                                                                                                                              | butcher, or dry-salted. They are best suited for tanning in the former and dition, as the salt cure of the North-Western Provinces is interpor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 165                                                                                                                                                                                         | imperfect, absorbing so much moisture that in the damp heat nia state<br>apt to rot; while the dry heat of the climate so hardens and con A aris the<br>fibres of the skin that much labour is required to loosen the pores with<br>of dry-salted hides, especially as native dealers lay on the <i>kfiarejf</i> were<br>the lime and tan. Great precaution, therefore, is necessary in the server<br>of dry-salted hides, especially as native dealers lay on the <i>kfiarejf</i> were<br>the lime and tan. If the hides are fresh slaughtered and<br>been lightly cured, they soak down to a natural state in about two up<br>but if they are stale, that is, have been cured some months a na <b>are</b><br>smeared with <i>kharee</i> , the tanner should reject them, for they will very? likely<br>decompose in the soak before becoming soft. Buffalo is the on ry f? jl count<br>hide that will produce leather thick enough for harness work in the<br>try; but there is no doubt that much of the inferiority of country <b>gat</b> he<br>arises from the poorness of the skin of that beast. It is poony ted >. A<br>generally cared for, and usually killed when too old to breed or give up<br>the hide of the male buffalo is too coarse, and it gets such Daa rrt <sup>*</sup><br>ment in the plough or the cart that it is generally full of sores and si<br>marks. In large towns there is a market for buffalo beef for the row <i>i</i><br>and poorer Mussalman population, and also for grease, but the y <b>ount</b><br>and better cattle are rarely slaughtered; it is from these that the 10 <sup>ca</sup> we |
| ,<br>Bullock and<br>Cow Hides.<br>166                                                                                                                                                       | ners select their hides for the finer uses of harness, saddlery, and account<br>ments. Many good hides are ruined by the butchers in "flaying, 1" of<br>inefficient arrangements in the slaughter-houses and from injudicious<br>of their tools. "J<br>"BULLOCK AND COW HIDES are also procured green and $d_{\Lambda y}$ "sa! $f_{\Lambda}$<br>but the same care is necessary in selection. The animals slaughtered Py<br>the Commissariat Department are usually the best, but they are small .an<br>unfit for any thick work. This class of hides is much exported to ^England<br>and extensively used there for boot and shoe upper leather, for which it .i<br>much esteemed. In the English market there is great objecticti to North<br>L; 166                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| Materials used in Tanning. (J, Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | LEATHER.                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| West sumed hides Dates Dates and Dunhumash sume thank the hide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                            |
| West cured hides. Patna, Dacca, and Durbungah cures, though the hide<br>are not in themselves superior, are far preferred. The finest hides of this<br>description are those killed at Agra, Delhi, and Meerut. Much damage<br>is done to the hides by branding on the butts and shoulders.<br>••GOAT AND SHEEP SKINS are always obtained green from the loca<br>market; goat skins are generally very good 5 sheep are poor and small.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | s<br>e                                                                                                                     |
| MATERIALS USED IN TANNING, &c.<br>"Lime is brought into Cawnpore, chiefly from the Banda District, and<br>is used for loosening the hair and flesh of hides and killing the grease. I<br>should be taken in lump, unslaked.<br>"Babul bark is obtained locally, the wood being extensively used for<br>firing. The bark season extends from January to June, that is, the spring<br>of tKe year, when the sap is upon the trees; from six to ten-year old trees ar<br>the best for bark. The bark should be peeled from the trees immediately<br>after they are cut down. The natives are rather careless in this particular<br>and greatly injure the bark, for, to get it separated from the wood, they bea<br>it with wooden mallets, and gash it about to get it loose; they then peel it of<br>by hand; each gash is a wound in the bark through which the tannin es-<br>capes. In England a peeling iron is used, and long strips of bark ar<br>taken off without any beating, but of course this must be done before th<br>sap has dried. The tannin is contained in the white or inner stratum on<br>the bark. The tannin is stronger in babul than in oak bark, but the quality<br>is not considered so good.<br>"Experiments tried lately in England by Professor Abel, the Chemiss<br>to the War Department, proved babul to have keeping qualities quit | d MATERIALS<br>USED IN<br>TANNING,<br>168<br>White OP<br>stone lime.<br>169<br>Babul Bark.<br>170<br>f<br>e<br>e<br>f<br>y |
| equal to oak bark, if not superior; it is thus a valuable tanning agent<br>But it has more colouring matter, that is, it gives a reddish liquor, and thi<br>is somewhat against it, but a great advantage is found from mixing with<br>it, <i>hurr</i> , or <i>bahaira</i> (the myrobalan of commerce—the dried fruit of Termi<br>nalia Chebula,), which is plentiful in the market, and is used extensively a<br>a dye. The liquor from the <i>hurr</i> , or <i>hurra</i> , is a powerful tan, and thoug<br>it is not reported to be of a quality that would make good leather of itsel<br>it is highly esteemed in England to mix with other tanning agents, owing t<br>the bright colour it imparts, and herein is its usefulness in combination<br>with <i>babul</i> . The <i>hurr</i> is a product of the forest, and is very common, but                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | s<br>s<br>h<br>- Myrobalan.<br>s<br>171<br>f,<br>o<br>n<br>t                                                               |
| the natives of Cawnpore use it only as a dye. <i>Sumach</i> is another tannin substance, which has been used in small quantities at this tannery, but onl for finishing and imparting colour. It is imported from England and therefore very expensive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | y 172                                                                                                                      |
| "Cu&ch is a very powerful astringent and rich in tannin. It is the inspissated juice of Acacia Catechu (the <i>khair</i> of the forests), and is used by the natives as a dye and is also eaten with $pán$ ; its tannin is three of four times stronger than that of oak, but of poor quality; the leather made of it is of dark colour and does not last well, but tans so quickly and there fore so cheaply, that it is used extensively in England: such leather is believed to be unsuited for wear in this climate. At Cawnpore the Cutc is employed only for darkening colour when that is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | d Japonica<br>or Kutch.<br>e 173<br>e-                                                                                     |
| " <i>Divi-Divi</i> is the pod of a shrub that is a native of South America, bu<br>grows well in the Madras and Bombay Presidencies; it is called th<br>Caesalpinia coriaria. The pod is exported from Bombay to England, bu<br>in small quantities. The tannin is strong and considered good for mixin<br>with barks. The shrubs were grown at Cawnpore from seed and a planta<br>tion of about 6,000 or 7,000 trees is doing well. The barks of <i>Sal. Asaina</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | e 174                                                                                                                      |

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| LEATHER.                          | Operations of the Tannery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| TANNING.                          | regarding Indian tans the reader is referred to the article on • Tanning<br>materials, Vol. VI.)                                                                                                                                                                                                                                                                                                                                                                                               |
| <sup>Cod-oil.</sup><br>176        | <sup>14</sup> The only oil used for currying is cod-oil; it is obtained from England,<br>and is the best known for the purpose. Indian fish-oil would answer, »<br>more carefully extracted. Mutton or goat tallow is used either alone or                                                                                                                                                                                                                                                     |
| Tallow<br>dubbing.                | mixed with cod-oil; in the latter state, it is called "dubbing," which is<br>applied to all leather intended for harness straps, or like pliable purposes.                                                                                                                                                                                                                                                                                                                                     |
| 177                               | OPERATIONS OF THE TANNERY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Labour.<br>178                    | <sup><i>u</i></sup> Native tanners and curriers are all of the <i>Chamar</i> caste; the former are <i>Runghtas</i> , a trade class of that caste; such labour is very plentiful about Cawnpore. The wages vary from R5 to R9 per mensem according to skill.                                                                                                                                                                                                                                    |
| Liming.<br>179                    | The hide when received green is only washed and put into a pit pi<br>milk of lime, but if it has been salted and dried out, it has to be soared in<br>soft water before it can go into lime. It is often so hard dried that it wi<br>not soak down, and heavy fulling stocks are required to break it down ana                                                                                                                                                                                 |
| Unhalring<br>and fleshing.<br>180 | soften it ready for the liming process,<br>"The hides are first put into weak lime and then into stronger, until the<br>hair is loosened and the skin 'plumped' up; they are then placed over<br>tanner's beams made of cast iron and convex, so that a two-handled, blunt <sub>f</sub><br>concave knife can be worked over them to push off the hair. When this                                                                                                                               |
|                                   | has been accomplished, the hide is turned over on the same beam, and the flesh and fat which was left on and has now become loosened by the $*^{2^n}$ of the lime, is shaved off by means of a two-handled, concave, fleshing $k^{n_1}$ which has sharpened edge, and takes off a greater or less shaving as required. Some dexterity is needed in this work, as a slip of the km may shave too deep and cut into the hide. The most skilled tanners ar employed in this and called 'beamsmen' |
| Use of Lime.<br>ISI               | "There is great diversity of opinion in the trade as to the use of lime.<br>It is generally allowed that it is an evil but a necessary one; it is not & for leather, but the hair and flesh must be removed, and there is no sate way of doing so. In the French ajid in some of the American tennene the hair is removed by sweating the hides and producing partial decomposition, but this would be too dangerous in a climate like that or Ind 5'                                          |
| Graining or<br>Bating.<br>182     | "Lime being an evil, it becomes necessary, after it has done its work, to<br>rapidly obliterate all traces of it in the texture of the hide, and this $tor/t^* \wedge$<br>the second process of the tanning and is called 'bating' Sole $le \& n e^{-1}$<br>does not require this process, but for all harness and dress leather and, tor                                                                                                                                                      |
|                                   | every soft purpose it is essential. The hides after being unhaired, fleshed,                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ran gralner.<br>183               | and washed, are thrown into a pit called a 'grainer/ in which bran ana<br>water have been allowed to ferment; the acid thus produced removes trie<br>lime from the texture of the skin and loosens and distends the pores, so thac<br>they are cleaned of every foreign substance and brought into a state nigniy                                                                                                                                                                              |
|                                   | sensitive to the action of tannic acid. $f$ r<br>"Much caution is needed in India in the management of grainers, for 11<br>the hides are left a few minutes too long, the acid dissolves the gelatinous<br>materials, the action being quicker than in England owing to the higher<br>temperature.                                                                                                                                                                                             |
| geon or hen<br>mg gralner.<br>I84 | "Bran being sometimes expensive, the ammonia from pigeon or hen<br>dung has been tried with some success; this is a usual grainer in England,<br>but there have been difficulties in collecting- sufficient quantities of it at                                                                                                                                                                                                                                                                |
| tale liquor<br>grainer.<br>185    | Cawnpore, and even when procured, it is often so full of extraneous sub-<br>stances that bran is preferable.<br>"The native tanners of Cawnpore use a grainer of stale fermenting tan<br>liquor, and this is so inexpensive that it is used for all heavy leather in the                                                                                                                                                                                                                       |
| <del>-</del>                      | Government tannery. It is notable that the French use stale rotten liquors L. 185                                                                                                                                                                                                                                                                                                                                                                                                              |

| Products of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 609                              |
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| Operations of the Tannery. ( <b>7</b> . Murray!)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | EATHER.                          |
| often their skins, and they are most successful in their                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TANNING.                         |
| ns of sulphuric acid have been tried, to plump up the<br>is expensive, and all the above mentioned grainers give<br>me result. An experienced tanner can tell by feeling<br>ney have been brought down enough, and are fit for the<br>is the tanning proper.<br>seess of bating has been gone through and before being<br>s the hides are once more put on the beam, and all dirt,<br>moved. A new and recently patented process of bating<br>the Harness and Saddlery Factory at C awn pore. The<br>mply of using carbonic acid gas to swell the hides and<br>greases by chemical action. The gas is generated in<br>n whiting and sulphuric acid; and is introduced into a<br>and skins are in water. After an hour or an hour and<br>action separates and deposits the lime, and the greases<br>n of soap ; and by scudding the hide over a beam, all<br>dissipated, and the hide is far better prepared for the | Sulphurie<br>id grainers.<br>186 |
| ny of the old processes.<br>broken and ground in a bark mill with breakers. The<br>bres of the bark, and the mill crushes and grinds it, thus<br>infusion in cold water and facilitating the extraction of<br>s with breakers are used at Cawnpore for this purpose,<br>a powerful steam engine.<br>re ground and crushed in a disintegrator which is speci-<br>urpose.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bark<br>grinding.<br>187         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Tanning<br>proper.<br>188        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Infusing<br>bark.<br>189         |
| bark has given off a liquor, the half-spent material is cast<br>spenders, where afterwards another half-spent liquor is<br>ure being freshened up and so on till the bark is quite<br>own out. The liquors are continually worked over and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Spending<br>1 f+<br>)            |
| from the grainer they should not be subjected to the<br>tannin; they are therefore continually handled or taken<br>pits. The pits are called 'handlers.' For the first                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Iandling.<br><b>IQI</b>          |
| handled daily, then gradually allowed to remain longer<br>are fit for the next stage, which is called dusting. The<br>sters.' The hides are put into a stronger liquor with<br>bark thrown in between each layer of four or five hides,<br>of the liquor up as the hides suck in the tannin.<br>the hides are taken up weekly, and then fortnightly,<br>re supplied and fresh bark added.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Dusting.<br>192                  |
| La<br>oes on for three or four months, and then the hides are<br>ay. The pits are now called * layers,' and the hides are<br>ong liquor, with quantities of fine bark between each.<br>e for a month or two at a time absorbing the tannin.<br>or from layers, dusters, and handlers are always drain-<br>of the spenders, and these after being freshened up are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ying away.<br>193                |
| . U 193                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                  |

| LEATHER                                 | Native Process of Tanning; Currying.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TANNING.                                | brought up again by means of the pump; thus they are kept moving<br>which is very important, as it retards the formation of gallic acid which is<br>injurious to the tannin, and which is but too apt to form in hot weather.<br>"Babul bark and myrobalans are infused together, and the addition of<br>the latter adds great strength, and takes away from the deep colour of the<br>liquors.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| rime taken in<br>tanning.<br><b>194</b> | *' The hides are kept three or four months in layers, and by that time in<br>general the tannin has penetrated right through them, and they are tanned.<br>Buffalo hides take from nine months to a year from first to last according<br>to weight and substance; cow hides are tanned in from four to six months<br>sheep and goat skins are done in tubs, and take from a month to two<br>months.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                         | "The climate of India is favourable to the penetration and combination<br>of tannin with the gelatine of hides. The chief danger to be guided<br>against is the fretting of liquor and production of gallic acid, a compound<br>more readily produced in Indian Tanning owing to the atmospheric heat.<br>"After the hides are tanned, they can be dried and stored, but in this<br>country they are apt to dry so hard, and to darken so much by the action<br>of light and air that it is thought best to curry them at once, especially for<br>harness work or dress leather. For sole leather or crop hides no currying<br>is required, but they are struck, that is, pressed down and rolled, and then<br>stored.                                                                                                                |
|                                         | NATIVE PROCESS OF TANNING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Native<br>tanning,<br>195               | <sup>w</sup> Native tanners carry out the liming process very much like that described ; they, however, rather overlime the hides according to English ideas. Their grainer is very effectual as far as softening the skins; they then rinse out all moisture, and, while the pores are yet opened, they work the hides in liquor, and afterwards sew the hide up into a bag having one end open. This bag is filled with finely pounded bark and hung up over a pit from which liquor is ladled into the bag, and there a v&y strong infusion is formed which percolates through the pores of the hide. This tannin therefore goes right through the hide, but it has not time to make the chemical combination, which is considered so essential for the leather. Native tanning does not occupy more than a week.                  |
| Currying.<br>196                        | CURRYING.<br>•• For harness and all dressing purposes, the currying is a most necessary<br>and important process. By tanning, the hide has become leather, but it is<br>not fit for use without currying. This consists of a number of manipula-<br>tions, e.^., stoning, shaving, scouring, oiling, reshaving or flattening, setting,<br>resetting, dubbing and finishing.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Stoning.<br>197                         | "For ordinary harness leather a buffalo hide, as it comes from the tar<br>pits, is hung up till it is half dry, when it is stoned out with a rough stone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| {Shaving.                               | on a flat table, to straighten it as much as possible.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 198                                     | <ul> <li>"It is then thrown over a currier's beam, an upright thick plank faced with Lignum vitae. This is the beam board for shaving on. The hide is smoothed down the board, and the currier, with a two-handled shaving knife, having a turned edge, takes off the outer flesh and inequalities from</li> <li>the flesh side, in fact, levels the hide as nearly as he can do so, having regard to economy in not wasting leather. The object of this shaving is to get the hide to lie flat on a table, so that the scouring stones and sleeper may touch each part of the surface with equal pressure and thus thoroughly clean it as well as press out all dirt and bloom or server the denosit from the surface with equal pressure and thus thoroughly clean it as well as press out all dirt and bloom or server.</li> </ul> |
| Preparing the<br>shaving<br>knife       | clean it, as well as press out all dirt and bloom, or earthy deposit from the<br>bark that remains in the tissue.<br>'« The preparation and use of the currier's shaving knife requires skilled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 199                                     | men, each man sharpens and turns the edge of his own knife. He firs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Process of Currying. (7.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Murray?)                                                                                       | LEATHER                               |
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| rubs it and clears a perfect straight edge, then places his<br>upwards, before him on the floor, holding it between his knees,<br>it against the wall; in this position he takes in both hands a<br>and presses it along the straight edge, with more or less pressure<br>to turn the edge. This edge catches the lumps and inequalities<br>side and shaves them off. When shaved the hide is laid flat                                                                                                                                                | and resting<br>heavy steel<br>e as required<br>of the flesh<br>on a stone                      | CURRYING.                             |
| table, and undergoes a series of scourings and pressings out on<br>to remove bloom and dirt and take out crease. After this it is<br>two days in sumach or myrobalans to give it a finishing col                                                                                                                                                                                                                                                                                                                                                       | steeped for                                                                                    | Scouring.<br>200                      |
| infusions are made with boiling water.<br>"The hide is then taken to another table, and sleeked out of<br>with a steel sleeker; then while still wet, cod-oil is rubbed li                                                                                                                                                                                                                                                                                                                                                                             | ightly on the                                                                                  | Steeping In<br>Sumach<br>water.       |
| flch, and more heavily on the grain. It is then hung up to<br>to be drawn into the pores of the skin as the water evaporates.                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                | 201<br>Oiling.                        |
| "When about three parts dry it is passed through a stoning<br>pendulum roller; this is done to make the leather firm and t                                                                                                                                                                                                                                                                                                                                                                                                                             | to get out the                                                                                 | 202<br>Flattening                     |
| stretch, and, then, for a second time, it is placed on a currier's<br>lightly re-shaved on the flesh side, that is, the roughness<br>without sacrificing much of the leather. This process is called                                                                                                                                                                                                                                                                                                                                                   | is taken off<br>l flattening.                                                                  | 203                                   |
| "After this it is hung up again to dry a little more. It i<br>stoned out on a table. Then the table or sufficient portion of a<br>hide to lie on is rubbed over with dubbing (a mixture of oil                                                                                                                                                                                                                                                                                                                                                         | table for the                                                                                  | Setting on<br>dub.<br><b>204</b>      |
| The hide is laid on the dubbed table, grain upwards, so the adheres to the table; in this state it is well set out, that is, stretched out as much as it will go by pressure with a hard                                                                                                                                                                                                                                                                                                                                                               | hat the flesh<br>, the hide is<br>setting stone                                                |                                       |
| with a smooth edge. To do this the hide is damped down i<br>in which it may have dried too much.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | • •                                                                                            | ļ                                     |
| "When fairly set, it is allowed to dry a little, then stoned ou<br>side, and afterwards reset on the gram side, to prepare for<br>which is now laid on with a brush, rubbed in and smoothed do                                                                                                                                                                                                                                                                                                                                                         | the dubbing                                                                                    |                                       |
| <ul> <li>palm of the hand.</li> <li>" Care must be taken that the hide is equally damped all of is • dubbed,' otherwise the dry parts will remain dark in cold dry climate it is very necessary to watch that hides do not g the processes of ' currying.' When dubbed, the hides are hundred when the generation has generated with the leaving a white generated by the processes of ' currying.'</li> </ul>                                                                                                                                         | our. In this<br>et too dry in<br>ng up to dry,                                                 | Dubbing or<br>stuffing.<br>206        |
| and when the grease has gone well in, leaving a white coatir<br>tallow on the outside, they can be taken down and finished<br>done on a table. First, the flesh side is smoothed with a pebt<br>then the grain is * sleeked' with a fine 'sleeker' to remove th<br>tallow, then sleeked with the pebble and glass to make smoot<br>up a gloss; the hide is then dried out. After all this, the hide<br>the saddler and harness maker. It is prepared for various oth<br>with more or less dubbing, as the leather may be required fo<br>hard purposes. | off, which is<br>ble or glass,<br>he coating of<br>h and bring<br>is ready for<br>her purposes | Finishing.<br>207                     |
| <sup>M</sup> Cow hides do not require so much setting as buffalo, bu<br>oiling and dubbing in proportion to their thickness. For very<br>cow hides are softened by hand labour with a crippling board w                                                                                                                                                                                                                                                                                                                                                | soft uses the                                                                                  | Curr Cov<br>H<br>208                  |
| <ul> <li>the grain.</li> <li>•' Sheep and goat skins are oiled and then set, and dubbed, h dried out, after which they are softened.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                | Sheep and<br>Goat skins.<br>209       |
| "The following tools are used in tanning-:—tongs for lifting<br>limepits; unhairing, fleshing, and rounding knives; tanner<br>lifting hides out of tanpits; scudding knives; striking pens.                                                                                                                                                                                                                                                                                                                                                            |                                                                                                | Tools for<br>Tanning<br>210           |
| "The following tools are used in curryingj:—currier's shav<br>sharpening and turning steels; scouring, pumice and setting st                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                | · · · · · · · · · · · · · · · · · · · |
| 39*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | L. 211                                                                                         | 211                                   |

| LEATHER.                   | Native Currying.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CURRYING.                  | ing, finishing, and glass sleekers; pebblej stuffing brush ; crippling board*<br>rub-stone and clearing-stones for sharpening knives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                            | NATIVE CURRYING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Native<br>currying.<br>212 | "The natives neglect the currying process of their leather. There is no<br>trade corresponding to the currier's in this country. The best harness-<br>makers curry their leather before cutting it up into straps, in fact they curry<br>it in strips of a foot wide, and apply tallow only; very often they appJy nothing<br>but buttermilk, which gives the leather a very bright appearance, but the<br>moisture very soon evaporates, and the leather becomes hard and brittle."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Native<br>Leather.         | BEST KINDS OF NATIVE LEATHER,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Leäther.                   | BEST KINDS OF NATIVE LEATHER,<br>As above stated the usual product of the Indian tanner is a har J, im-<br>perfect, thick leather which is very pervious to water, and is not at all dur-<br>able. In certain localities, however, fancy leathers are produced of a very<br>good quality. Perhaps the best of these is the soft wash-leather of the<br>Kangra and Hushiarpur districts of the Pan fab, and the red skins<br>of Nurpur. The former is of a very soft texture, of a greenish buff colour,<br>and so thin and pliable as to be made into gloves, or the breeches which are<br>constantly worn by the Kangra hill-men in the colder months. The method<br>of preparation is described by Baden Powell as follows:—" First, the skin<br>is wetted, and then steeped in a matka or earthen pot full of lime and water,<br>the mixture to be sufficient in quantity to cover the skin is thin, twenty<br>days of this treatment suffice; if thick, one month. After this the skin is<br>washed in clean water, and then well rubbed with the dried and powdered<br>leaves of the <i>dhao</i> tree (Anogeissus latifolia, <i>Wall.</i> ) for two hours succes-<br>sively. After the rubbing is over the leaves and skin are put together in a<br>vessel and water added. Next day the skin is tied on a stick and wrung out,<br>(as a <i>dhobi</i> does clothes). Again it is steeped in a fresh solution of the<br>leaves, and this process of steeping and wringing out is repeated for four days<br>consecutively; fresh leaves are to be used each time. The skin is then sewed<br>up with a <i>munij</i> string, into the form of a hollow sack, filled with <i>dhao</i> leaves,<br>and hung up. On being taken down it is reversed and hung up again by<br>the other end; this ensures both ends being well impregnated with the solu-<br>tion—the process occupies two days. The skin is then opened out, dried,<br>well rubbed with oil, and eventually washed. When dry it is scraped with<br>an iron implement called <i>rambi</i> , and is thereafter again rubbed with oil.<br>After three or four days it is washed in cold water and dried. It is then<br>rubbed with a mixture of curds and water and again dried, the |

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| Native Leather.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | LEATHER.                                         |
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| are then put into water, rubbed with pieces of rough<br>completely removes the hair, &c., and again washed.<br>have been prepared thus far they are together put init<br>cauldron or <i>ndnd</i> , along with barley-meal 6 seers, salt 2j<br>is poured on. They are left to soak in this for four days, th<br><i>kath</i> (coarse catechu) are added. The soaking is continu-<br>days longer, after which the skins are taken out and agai<br>iron <i>kh</i> : <i>rpa</i> or scraper. They are again soaked in a <i>nd</i><br>barley-meal and 3 seers of salt dissolved in fresh water, fo<br>to four days. The process of dyeing is now performed by<br>for three or four days in solutions prepared as follows :—Fr<br>boiled in water with 2 chittacks of <i>sajji</i> (coarse soda) and t<br>bark of the <i>lodar</i> tree (Symplocos ? crataegoides, <i>Ham.</i> ).<br>the skins are removed to an infusion of the bark of <i>amalta</i><br>and allowed to soak for three or four days ; they are ther<br>colour fixed by rubbing the skins with powdered salt.<br>paring 40 red skins is R12-9-6." The leather thus prep<br>in the manufacture of belts, ornamental native shoes, saa<br>account of which the reader is referred to works on Ind<br>and Art Industries.<br>A soft leather of very fine quality is prepared to a sn<br>rat, for the purpose of covering the easy chairs known as<br>It is probably manufactured by a more or less satisfactor<br>European process of softening, dyeing, and polishing lea<br>English leather and several ornamental leathers.<br>Trade.—The following passage occurs in the Revit<br>rrade of India for 1888-89 — "Having regard to the <i>l</i><br>arge a population as that of India, the inland trade in<br>tures, valued at 83 lakhs of rupees in 1888-89, seems alt<br>tonately small. The apparent discrepancy is, however,<br>for by the communal institutions of the people. Each vi<br>workers in leather, who are also, to a large extent, their oo<br>is part of their recognised duties to keep their patrons in<br>and make up the hides required for the leathern buckets<br>tion. The needs of the agricultural population being thu<br>without the intervention of traders, the traffic is practical<br>leather goods tra | When forty skins<br>o a great earthen<br>j seers, and water<br>en 2 seers of <i>ban</i> -<br>ned for four or five<br>in scraped with an<br><i>nd</i> with 7 seers of<br>or a period of three<br>soaking the skins<br>our seers of lac are<br>wo chittacks of the<br>From this solution<br><i>as</i> (Cassia Fistula)<br>n removed and the<br>The cost of pre-<br>pared is employed<br>ddlery, &c, for an<br>ian Manufactures<br>hall extent in Guj-<br>" Gujrat" chairs.<br>'y imitation of the<br>ther.<br>largely imported,<br>from Afghanistan.<br>ew of the Inland<br>consumption of so<br>n leather manufac-<br>ogether dispropor-<br>readily accounted<br>llage has its own<br>wn tanners; and it<br>boots, and to cure<br>s made for irriga-<br>is locally supplied,<br>ly restricted to the<br>urmy.<br>I reputation in the<br>'atna, Poona, &c.,<br>for native shoes.<br>ry, is noted for its<br>blies the cities of<br>pplanted those of<br><i>Statistical Tables</i><br>eturned in all, of<br>Cawnpore, and 2<br>ar as known, from<br>The 15 principal<br>, out of which one<br>ne Rail and River-<br>nat the total quan-<br>to 71,768 maunds,<br>d 14,137 maunds,<br>Provinces exported | NATIVE<br>LEATHER,<br>TRADE.<br>Internal.<br>213 |

613.

| LEATHER.                                                              | Coasting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | and Foreign Tra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | de.                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                |
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| TRADE.<br>Internal*<br>Coasting*<br>214<br>Foreign<br>Imports.<br>215 | <ul> <li>value, 1*19,22,515. Similarly, the exports from thePanjab are seen to her large, 17,928 maunds, and again of considerably less proportionate value than those from Calcutta, amounting only to R 10,03,968. Following of these were Bombay Town, Bengal, Sind, Madras Seaports, Bombay Karachi, Madras, Mysore, Rajputana and Central India, the Central Provinces, the Nizam's Territory, Berar, and Assam, named in order of in portance.</li> <li>The largest importing provinces was Bengal, with 24,537 mauntis, 1/alue at 1*36,25,089, followed by Calcutta town with 11.703 maunds, value R 10,86,074. Next in order of importance were the North-West Product in and Oudh with 8,390 maunds, value R7,8\$,97i, the Panjáb witr. <sup>ne * r</sup> V Jr same amount, then Sind, Bombay, Rajputana and Central India, "for Central Provinces, Madras Seaports, Bombay Town, the Nizam's Territor, Assam, Berar, Madras, Karáchi, and Mysore with much smaller quantitie COASTING TRADE.—The trade in foreign leather is not recorded, apparatuments.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | tionate value<br>Following on<br>ts, Bombay,<br>Central Pro-<br>order of im-<br>untis, l' <b>alued</b><br>unds, <b>value</b><br>vest <sup>Pro % in %</sup><br>tr. <sup>ne *r</sup> V Jr <sup>^</sup><br>il India, "ie<br>n's Territory,<br>er quantities.<br>corded, appa<br>. In India<br>from Bengal<br>noes (Indian;<br>al to Burma.<br>ts of F <sup>°, rei</sup> ?"<br>pment m.tn. |                                                                                                                                                |
|                                                                       | Unwrought Leather .<br>Leather Manufactures<br>TOTAL<br>The principal market from<br>leather is imported is the Unite<br>for which statistics are availab<br>of rupees, over 15 lakhs repress<br>Small quantities are also obts<br>Australia, Austria, Germany,<br>large proportion of the leather<br>1888-89) consists of Saddlery at<br>in 8881-89 was as follows:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ••• 9»02,975<br>••• 9»02,975<br>••• 9»02,975<br>••• 9»02,975<br>••• 9<br>••• br>9<br>••• 9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>••••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>•••<br>9<br>••••<br>9<br>••••<br>9<br>••••<br>9<br>••••<br>9<br>••••<br>9<br>••••<br>9<br>•••••<br>9<br>•••••• | 12,09,14*56,vrought and ror example, ina total valuefrom the Unittraits Settlemon, and other c, and other c, akhs of rupeee distribution o                                                                                                                                                                                                                                             | 873<br>173<br>046<br>nanufactured<br>the ^ast vAP<br>of 16J la <sup>kn9</sup><br>ed Kingdom.<br>ents, France,<br>countries, Å<br>s in value in |
|                                                                       | Bombay<br>Sind<br>Madras<br><b>Burma</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | akhsR 1*19<br>33 1'97<br>34 06<br>35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2-49<br>2*32<br>•32<br>•36<br>•44                                                                                                                                                                                                                                                                                                                                                      | •84<br>5'i7<br>'21<br>'65<br>•19                                                                                                               |
|                                                                       | Total L:<br>L. 215                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | akhs R 37                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5*93                                                                                                                                                                                                                                                                                                                                                                                   | 7 <sup>f</sup> o6                                                                                                                              |

Trade in Leather.

## (J. Murray.) LEBIDIEROPSIS

orbicularis. TRADE. The imports in 1889-90 (details not given) were valued at 18\*48 lakhs of Imports. rupees, against 16\*69 in 1888-89. The figures of trade here quoted are exclusive of those of boots and shoes, the imports of which average about 12 låkhs rupees. The United Kingdom is the largest supplier of these, and Bengal and Bombay take by far the greatest share between them. Frontier. FRONTIER TRADE.—The imports from across the frontier average 1\*20 216 lakhs of rupees. The average exports are about R2f lakhs (chiefly manufactured leather) : the trade is mainly between Kábul and the Panjáb. The RE-EXPORT TRADE is small and unimportant. The average for the Re-export. five yeaVs ending 1883-84 was 25 cwt. of unwrought leather, valued at 217 R 14,566, and manufactured leather, value R3O,6io. During the past five years the average in both cases was smaller, viz., 21 cwt. of unwrought leather, valued at {£2,721, and manufactured, valued at R 19,023. The re-export trade is principally between Bombay and the United Kingdom. Exports-Indian. EXPORTS OP INDIAN LEATHER.—The exports of unwrought leather have slightly increased in quantity but diminished in value during the period 218 under consideration; the exports of manufactures have slightly increased in value. Thus, in the five years ending 1883-84, the average was 184 cwt. of unwrought leather, value, ^14,566, and manufactures to the value of R22,295, while during a similar period ending 1888-89, the average was 291 cwt., value ££14,382, of unwrought leather, and the manufactured article to the value of R26,368. In the above statistics a small quantity of saddlery and harness, annually exported as Government stores to Aden, have not been included. In 1888-89 the value of this amounted to only R119. In conclusion it maybe noticed that the above figures show a steady increase in the amount of leather imported from Europe, notwithstanding the concurrent development of the Indian tanning industry. Also, that the amount of unwrought leather imported has increased in a higher ratio than the amount of leather manufactures, thus shewing a development in the demand for European leather, presumably intended to be manufactured in this country. LEBIDIEROPSIS, MilellMrg.; Gen. PL, III., 268. A genus of EUPHORBIACEA reduced in the Genera Plantarum to Cleistanthus, Hook./. Lebidieropsis orbicularis, *Müell.-Arg.*; EUPHORBIACE\*. 219 This species is reduced to **Cleistanthus collinus**, Benth., in the Flora of British India, V., 274. Sir J. D. Hooker, however, remarks that "the genus Lebidieropsis should probably be restored; the globose seeds differ wholly from those of any other Cleistanthus." When the description of the genus **Cleistanthus** was written in Vol. It. of this work, this species was inadvertently omitted, all the economic information regarding the plant in India being described by Bed do me, Gamble, Brand is, and others under Lebi**dieropsis.** The description may, therefore, for the purposes of this work, be given here. Syn.—BRIDELIA COLLINA, Hook. f. & Am.; AMANOA COLLINA, Baill.; LEBIDIEROPSIS COLLINA, Muell.-Arg.; CLUYTIA COLLINA, Roxb.; C. RETUSA and PATULA, Wight.; ANDRACHNE ORBICULATA, Roth.; A. CADISHAN, Roxb.; EMBLICA PALASIS, Ham. Vem.-~Garrar, garu'ri, HIND.; Karada, URIYA; Parasu,pas, pasu> larchuter, KoL. | Kargalli, SANTAL; Ghara, BERAR; Kergali, KHARWAR; Ganari, C. P.; Garari, MAR.; Wodayu, waddan, wudacha-marum, TAM. ; Korsi, wodesha, kadishen, korse, koricha, TEL. ; Madara, SING. References.—Roxb., Fl. Ind., Ed. C.B.C., 704; Brandts, For. FL, 450'. Beddome, For. Man., 203, t. 26,/.\$; Gamble, Man. Timb., 358; Thyaitas,

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| LEEA<br>_crispa                                                                | A useful wood for Turning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| MEDICINE.<br>Bark.<br>220<br>Fruit.<br>221<br>Leaves.<br>222<br>TIMBER.<br>223 | En. Ceylon PL, 280; Drury, U. PL, 276; Campbell, Ec. Prod. Chutia<br>Nagput, No. 7543; For, Ad. Rep. Ck. Nagpur, 1885, 6, 34*<br>Habitat.—A small deciduous tree, met with in the dry hills of various<br>parts of India; extending from Simla eastwards to Behar, and southward<br>to Central India and the Deccan; rare in Ceylon.<br>Medicine.—Roxburgh writes," The BARK or outer crust of the capsule<br>is reported to be exceedingly poisonous." The Rev. Mr. Campbell re-<br>ports that the FRUIT and bark are employed in Chutia Nágpur flo poison<br>fish, and that the latter is also considered a useful application in cutaneous<br>diseases. For severe headache, the head and upper part of the body are<br>bathed in water in which the LEAVES have been steeped.<br>Structure of the WoodRed, tough, moderately hard to hard, close<br>and even grained, warps in seasoning; heart-wood dark red, sapwood 9"«iai,<br>lighter coloured; weight 54 to 55ft per cubic foot. It resembles the wooa<br>of Eugenia operculata, and is almost identical with that of Flacourtia Ram"<br>ontchi {Gamble}. Beddome states that it is much used in India, and since<br>it coppices well and is procurable in great abundance, it may be <sup>s</sup> P <sup>e</sup> ^ 1^<br>recommended where fuel is required in the more tropical parts of the<br>country. It has also been described as a useful wood for turning* |
| 224.                                                                           | <ul> <li>LedebOUria hyacinthoideS, Roth.; see Scilla hyaciathoides, Linn=2<br/>[Vol. VI*</li> <li>LEEA, Linn.; Gen. PL, /., 388, 999.</li> <li>A genus of small trees, shrub, or herbs, belonging to the Natural Order<br/>AMPELIDE/E, which comprises about 25 species; most abundant in the tropics01<br/>Asia and Africa. Of these 15 are recognised by the Flora of British India as<br/>indigenous to this country.</li> <li>Leea aspera, Wall.; Fl. Br. Ind., /., 66\$; AMPELIDE*.</li> <li>Syn.—? L. HERBACBA, Wall. Cat., 6829 and6824E&amp;G (in part) under<br/>L. STAPHYLEA.</li> <li>Vera.— Kumdla, NW. P.; Kumdli, kurmdli, KUMAON; ffolma, PB.J<br/>Thakya-nway-than, BURM.</li> <li>References.— Brandis, For. Fl., 103; Kurs, For. Fl. Burm., 1., 281;<br/>Gamble, Man. Timb., 03; Stewart, Pb. Pl., 35; Athinson, Him. Dist.,<br/>807; Ec. Prod., NW. P., Pt. V., 03; Indian Forester, X., 325; Agri-<br/>H'or't. Soc. of Ind.; —Journ. (Old Series), X11L, 309; GaeetteersMy-</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   |
| FOOD.<br>Fruit.<br>225<br>226                                                  | sore & Coorg, /., 58; Bombay, XV., 431; NW. P., IV., Ixx.<br>Habitat.—A herb or small shrub of the Western Tropical Himalaya<br>from Jamu to Nepál, ascending to 6,000 feet; also met with in Oudh ana<br>Western India from Khandésh to the Konkan. According to Kurr, it is<br>common in the mixed forests all over Pegu, up to 2,000 feet.<br>Food.—Produces a small, black, succulent FRUIT, about the size of a<br>black currant, which is pleasant to the taste, and is eaten by the Natives.<br>L. Crispa, Willd.t Fl. Br. Ind, /., 66j.<br>Syn.—LEEA PINNATA, Andr.<br>Vern.—Ban-chdlitd, BENG. J Nalugu, MALAY. ; Kaletthein, kaphet-theing,<br>BURM.<br>References.—J?M»., Ft. Ind., Ed. C.B.C., 220,-Kurt, For. FL Burm.% At<br>280, For. Rep. Pegu, App. C., iv / Gamble, Man. Timb., 93; Dymocfc,<br>Mat. Med. W. Ind., 2nd Ed., 187 ; Pharmacog. Indie a, /., 3*5; Gaset-<br>teer. Bomb., XV., Pt. /., 430; AgriHort Soc. of Ind—Transactions,<br>VII., S3 / journals {Old Series}, VI., 36; IX., 41'.                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br>Leaves.<br>227                                                    | teer. Bomb., XV., Pt./., 430; AgriHort Soc. of Ind. —Transactions,<br>VII., S3 / journals {Old Series}, VI., 36; IX., 41'/.<br>Habitat.—A tall shrubby perennial, met with in the Sikkim Himalaya<br>and Khásia mountains, from 1,000 to 4,000 feet; also in Sylhet, Assam,<br>Chittagong, the Konkan, Pegu, and Martaban.<br>.Medicine.—The Rev. d. Long states (AgriHort. Soc. of Ind. Jour-<br>nal, ix.), that the LEAVES when bruised are employed in Bengal as an<br>L. 227                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Astringent plants. (7. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | LEE<br>acrophylla.                   |
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| application to wounds. Dymock, in his description of L. macrophylla, <i>30xb.</i> , writes, "The TUBERS of L. crispa, <i>Willd.</i> , are also used as a remedy for guinea-worm, and are said to be more efficient than those of L. <b>macro-phylla.</b> "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MEDICINE. '<br>Tubers.<br><b>228</b> |
| Leea hirta, Roxb.; FL Br. Ind., I., 668.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 229                                  |
| Syn.—L. SCAB RA, <i>Steud.</i><br>Vern.—Kdkjanghd, HIND., BENG. ; Sura fddi, TEL./ Nagamauk, ndgd-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      |
| <ul> <li>Makyangha, Mildo, BERG., Sava Jaa, TEL. / Ragamaak, Hagamaak, Hagamaak, Burna, BURM.; Kdkajanghd, kdkdngah, SANS.</li> <li>References.— Roxb., Fl. Ind., Ed. C.B.C., 220; Kurz, For. Fl. Burnt., I., 281; For. Rep. Pegu, App. C, iv; Gamble, Man. Timb., 93; Elliot, Fl. Andhr., 170; U. C. Dutt, hind. Mat. Med., 301; Phavmacog. Indica, I., 365; Campbell, Ec. Prod. Chutia Nagpur, No. 8136.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |
| * Habitat.—A shrubby perennial, met with in the Sikkim Himålaya,<br>Assam, Sylhet, the Khåsia mountains, Eastern Bengal, Chittagong, Pegu,<br>and the Andaman Islands. The Rev. A. <b>Campbell</b> reports having found<br>it also on Parisnath Hill in Behar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                      |
| Medicine.—The authors of the <i>Pharmacographia Indica</i> write, "Leea hirta, <i>Roxb.</i> ( <i>Kdkdjangha</i> ) is also used medicinally," but they neither give                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE.                            |
| an account of its properties, nor state in what part of the country it is uti-<br>lised. No information on the subject appears to be obtainable from the<br>works of other Indian writers; but it may be safe to assume that in this,<br>as in ether species of <b>Leea</b> , the IUDERS and STEMS are probably astringent<br>and mucilaginous.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tubers.<br>230<br>Steins.            |
| L. macrophylla, Roxb.; FL Br. Ind., I., 664; Wight, Ic, f. 1154.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 231                                  |
| Syn.—LEEA LATIFOLIA, Griff.; L. siMPLICIFOLIA, Griff.<br>Vtxn.~—Samudraca, dkolsamudra, HIND.; Dkolsamudra, BENG.; Hatkan\$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 232                                  |
| SANTAL; Dinda, BOMB.; Dinda, MAR.; Kya-bet-gyi, kyah-phet-kyi,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 252                                  |
| <ul> <li>BURM.; Dholasamudrikd, SANS.</li> <li>References.—Roxb., Fl. Ind., Ed. C.B.C., 219; Griff., Ic. PI. Asiat., 64s, f. 1; Brandtš, For. Fl., 102; Kurz, For. Fl. Burm., /., 278; For. Rep. Pegu<sub>1</sub> App. C.<sub>1</sub> iv.; Gamble, Man. Timb., 93; Dalz. &amp; Gibs, Bomb. Fl.<sub>9</sub> AT; Pharmacog. Indica, /., 364; U. C. Dutt, Mat. Med. Hind., 2<fl; *fones,="" 151,="" 187;="" 276;="" 291;="" 2nd.="" 503,="" 742;="" 92;="" agri-hort.="" and="" bomb.,="" burma="" campbell,="" chutia="" drury,="" dymock,="" ec.="" ed.,="" ind.,="" its="" lisboa,="" mason,="" mat.="" med.="" nagpur,="" no.="" of="" people,="" pl="" pl,="" prod.="" s3="" s770;="" sir="" soc.="" transactions,="" u*="" u.="" v.,="" viy.,="" w.="" works=""> Gazetteer*:—Bombay, XV., Pt. I., 430} NW. P., IV., Ixx.</fl;></li> </ul> |                                      |
| <b>Habitat.</b> —A large herbaceous perennial found throughout the hotter parts of India, from the Tropical Himálaya as far west as Kumaon, to Bengal, Assam, and Tenassenm; also met with in Western India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                      |
| <b>Dye.</b> —Roxburgh writes, "The ROOT promises to yield a colour fit for dyeing," but he does not state whether that remark is the result of personal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>DYE.</b><br>Root.                 |
| observation, nor for what reasons he was led to make it. The tubers are<br>of a deep red colour and very mucilaginous, but no record exists of their                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 233                                  |
| ever having been utilised for dye-producing purposes.<br>Medicine.—Roxburgh says that the ROOT is astringent and a reputed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MEDICINE.                            |
| remedy for ring-worm, and Dymock adds that it is employed in the cure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Root.                                |
| of guinea-worm, and when pounded is applied to obstinate sores to pro-<br>mote cicatrization. The Rev. A. Campbell reports that in Chutia Nagpur,<br>it is supposed to have anodyne properties, being applied externally to allay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 234                                  |
| pain. <b>Mason</b> mentions the plant, and states that it is sometimes culti-<br>vated in Burma for the astringent properties of its roots, the Burmans                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |
| using it as an application to wounds to stop the effusion of blood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FOOD.                                |
| <b>Food</b> —The LEAVES were used as an article of food in the Nasik dis-<br>trict during the famine of 1877-78. Lisboa states that, cooked as a vege-<br>table, they are regularly eaten in the Konkan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Leaves.<br>235                       |

.

| sambucing             | A. Astringent Plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| SACRED.               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Leaves.               | Sacred Uses Lisboa writes, "The large LEAVES of this plant are use<br>as platters for food every Monday during the month of Shrávan."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 236                   | Ionin of Shravan."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 237                   | Leea robusta, Roxb., m. Br. ind., /., 667.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | Syn.—LEBA ASPERA, Wall. Cat., 6825 in part; L. CCPACTXFLORA, Kur?<br>Vern.—Haramada, hatkan, SANTAL; Galoni,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ļ                     | Gino, GOA : COOL FRIANCE DOED : GALANI,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                       | Ind., 2nd Ed., 186; Atkinson, Him. Dist., 307; Campbell, Ec. Prod.<br>Chutia Nagpur, No. 7553.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|                       | Kh^o^i^t altitudes of 1,000 to 5t000 feet j also Martaban, the<br>Northern GrcTrs'; and Western India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MEDICINE.<br>Root.    | Cine. — Dymock writes "The                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 238                   | more archards in the Goa territory, is called ratanhia by the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| -00                   | Portugu a S dia dia Allandchronic durantary !! In the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| i i                   | more recent <i>Pharmaco^h?</i> $r \prod_{i=1}^{n} A'' t^{and chromit}$ dysentery." In the given regarding L? S in f. <b>W7</b> / <b>17</b> , "T ", the sarae information is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                       | busta. It may therefore $h^{n} r^{+} W_{I_{a}}^{*} h^{n} $ mention is made of L. ro-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                       | <b>Portugu^a^S^</b> d' d' d' and chronic dysentery." In the<br>more recent <i>Pharmaco^h?</i> r d' d' and chronic dysentery." In the<br>given regarding L? S u £ WUIG "T" the sarae information is<br>busta. It may therefore h^nr^''W*' and n© mention is made of L. ro-<br>Dymock were^nadvSly a PpH "^ hlm in h's earlier work to the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1                     | $\mathbf{O}  \mathbf{O}  $                                                                                                                                 |
| [                     | $a_{PP}$ HeTe <sup>P</sup> rha''^ni <sup>n</sup> nod^^ Nagpur the soft * <sub>&gt;</sub> * «eshy root is                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| TIMBER.               | appriete fuia "In nou", "", "", "", ", ", ", ", ", ", ", ", "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 239                   | tenoing ton states, and for building temporary huts (Gamble). used for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| OMESTIC. Stems.       | Domestic used for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 240                   | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 241   I               | <b> sambudna</b> , Willd.; FI. Br. ind., I., 6666 • Wight Ic <sub>9</sub> V-"lt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                       | L. sambudna, Willd.; FI. Br. ind., I., 6666 , Wight Ic 9V-"lt<br>oyn.—LEEA ^QUATA Wall (*.,,* ********************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                       | $(\mathbf{HINFA}  Wall \cdot \mathbf{I}  St^{\mathbf{HYLRA}}  *\mathbf{I}  \mathbf{\Delta}^{\mathbf{C}}  \mathbf{I}^{(1)}  \mathbf{M}^{\mathbf{C}}  \mathbf{I}  \mathbf{V}^{\mathbf{C}}  \mathbf{I}  \mathbf{V}^{\mathbf{C}}  \mathbf{I}  \mathbf{V}^{\mathbf{C}}  \mathbf{I}  \mathbf{V}^{\mathbf{C}}  \mathbf{V}^{\mathbf{C}}  \mathbf{I}  \mathbf{V}^{\mathbf{C}}  $ |
|                       | A. OTTILIS, Girtn • GILBRPT^ $^{***}$ ·'' $^{O}$ <sup>UI</sup> '' $\stackrel{O}{}$ EIA SAMBUCINA, ZI «II./                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| l l                   | VtWL^^^vtf <sup>E</sup> H.w", Bf^T^^ <sup>STAP</sup> HVLÉ GUSPONIA NALUGU,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | ankadisa, TEL,,,,,,,,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                       | References - Paul P BURM.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| l l                   | References Roxb., Fl. Ind., Ed. C.B.C., 221; Griff., Notul., IV., 677 /<br>Brandis, For. Fl., 102; Kurs, For. Fl. Burm.,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                       | Soc. Beng., 1873, 11., 65, 66; Gamble, Burm.<br>Ceylon Pl., 64; Dals. & Gibs., Rumh Fl. Man. Ti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                       | 20. Billant, Rivers A. J.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| į                     | The state in the second s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | $C = \frac{1}{2} \frac{1}{3} $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | Habitat—A glabrous shnfh vu' Bomb <sup>B</sup> J' <sub>x</sub> .y^-» ft. /., 430.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Š                     | Habitat—A glabrous shnfh vu <b>Bom</b> i <sup>B</sup> J' -y^-» ft. /., 430.<br>photter aristsoil stout ! <sup>of</sup> wooded stems; widely India,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | to and combined in the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Root.<br>242 n        | Mediciae—Rheede $c_{1}^{\text{Mb}}$ the plant Nalugu and S <sup>A</sup> <sup>10</sup> <sup>11</sup> and Malacca.<br>nime name. He states tC a horizontal states $c_{1}^{\text{Alugu}}$ and $c_{2}^{\text{Alugu}}$ as its Brah<br>Nat it is cooling and relieves K. $r^{f}$ (Rb $\infty$ ) is inverse coic, and the states $r^{f}$ (Rescale states $r^{f}$ ) and $r^{f}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| l ti                  | hat it is cooling and relieves K r'AK & colle is inverse colic, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| eaves. 1 û            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4 <del>1</del> 3   to | The bead in vention vevel, the way and any link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                       | Réunion the root is called $\Delta f$ Surray and is digestive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MBER, {               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 244 br                | Structure of the Wood.—" Rather heavy, close-grained, soft, pale-<br>nall; soon attacked by xylophages" (Kurs).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 50                    | nall; soon attacked by xylophages "(Kurs).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| . 41                  | soon attacked hu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Leeches Employed in India. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | LEERSIA<br>hexandra. |
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| LEECHES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |
| <b>The</b> LEECHES employed in medicine belong to the family GNATHOB-<br>DELLIDJE of the Natural Order HIRUDINEJE, of which they form the typi-<br>cal genus, HIRUDO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |
| Leeches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 245                  |
| <ul> <li>Vern.—Jók, jónk. HIND.; Jonh, BENG, J Drik, KASHMIR; Jala, Guj.;<br/>Attai, TAM.; Jelagalu<sub>t</sub> attalu, jeriku, TEL. J Jigani, KAN.; Atta,<br/>MALAY.; Miyon, minyon, BURM.; Kudallu, ptindal, SING.; Jalúkaha,</li> <li>SANS.; Aalaq, zald, ARAB.; Zaló, zaldk, PERS.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 243                  |
| Medicine.—Many distinct species of leech appear to be met with in<br>India, but they have not been scientifically determined. Several are used<br>n^edicinally and have long been known and valued by Sanskrit writers.<br>Busruta gives a detailed account of the different forms and of their habits,<br>modes of application, &c. He describes twelve kinds, six of which, he says,<br>are venomous, six useful. The former live near putrid fish and animals, in<br>foul stagnant pools, and are to be avoided; the latter inhabit clear and deep<br>pools which contain water-lilies and other sweet-smelling plants. Of these,<br>he states, that the middle-sized are the best. He directs that they should<br>be kept in a new water-pot, in which some clay, grass, or fresh leaves of<br>aquatic plants and water have been put, and that they must be fed on the<br>roots of water-lilies and dry flesh. When the leech is sluggish, he recom-<br>mends that a drop or two of milk should be applied to the part on which<br>it is required to fix, or that a slight scarification should be made. The<br>leech is induced to drop off by sprinkling salt on its head, and is cleaned<br>by stripping. {U. C Dutt, Mat. Med. Hindus, 275.}<br>The use of the leech was probably adopted from the Hindus by the<br>Muhammadans, with whom it is now greatly in vogue. At the present<br>time, the leeches used in Bengal are chiefly caught in tanks in the neigh-<br>bourhood of Baraset, by persons who collect them by entering the water<br>and allowing the leeches to catch hold of their legs. They are chiefly<br>gathered in May as the tanks begin to dry up. But the best leeches are<br>said to be obtained from the North-Western Provinces, chiefly from Sheko-<br>abad. Large numbers are, however, also caught at Patiala in the Panjdb.<br>SPECIAL OPINIONS.—§ "Leeches boiled with honey are used as a local<br>application for tonsilitis, and dried and rubbed with aloes as a local re-<br>medy for hsmorrhiods" {Dr. Emerson}, «* Boiled and ground up, they<br>are employed as an application to make the hair grow (Surgeon-Major<br>C. W. Calthrop, M.D., Morar). | MEDICINE.<br>246     |
| LEERSIA, Swart*.; Gen. PI., III, m <sub>7%</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 7                    |
| A genus of aquatic grasses comprising five species, of which one occurs in<br>India. They are similar in habit to Oryza, but the spikelets are smaller, the<br>glumes (of which there are only two) are also thinner, and there is no pale.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |
| Leersia hexandra, Swartz.; Duthie, Fodder Grasses of N. India, 21;<br>[ GRAMINEIE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | . 247                |
| Syn.—L. AUSTRALis, R. Br.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |
| <ul> <li>Vern.—Layt, SING.</li> <li>References —Symonds, Grasses of the Indian Peninsula, 5\$, t 40 •<br/>Thw., En. PI. Zeylanica, 3s6; Campbell, Ec. Prod. Ckutia Na^pur No'<br/>8169; Von Mueller, Select Extra-Trop. Plants* 219; Maiden, Useful PI<br/>of Australia, 9j.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |
| Habitat.—Found occasionally bordering tanks and on wet ground<br>throughout India and Ceylon; distributed to Africa ar.d the warmer parts<br>of America and Australia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |
| L. 247                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | •                    |

| LENDI-PII      | PLI. Duck-weeds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| FODDER.<br>248 | Fodder.—Symonds states that horses and cattle are fond of this grass,<br>a remark confirmed by Australian writers, who assert that it is one of the<br>most esteemed of the aquatic grasses of Eastern Australia. Baron yon<br>Mueller mentions that it is regularly cultivated for fodder in the Philip-<br>pines, in the same way as rice.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 249            | Leingatlg, a sort of earth found everywhere in Manipur and used for imparting a <i>khaki</i> colour to cloth (see Pigments); also employed as an article of food (see Clays, Vol. II., 361).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 250            | <b>LEMNA,</b> <i>Linn.; Gen. PL, III., 1001.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                | A genus of water plants, popularly known as "duck-weeds," which be-<br>longs to the Natural Order LEMNACE^B, and comprises seven speiijes,<br>natives of fresh waters of temperate and tropical regions. Of these five<br>are (according to <i>Kurg, Linn. Soc. Jour., IX., 264</i> ) natives of India,<br>namely, L. gibba, <i>Kurz,</i> L. minor, <i>Linn.,</i> L. oligorrhiza, <i>Kure,</i> L. <b>polyr-<br/>rhiza</b> , <i>Linn.</i> , and L.trisulca, <i>Linn.</i><br>Certain of these species, particularly L. minor, frequently invade<br>flooded rice fields, and by their thick growth on the surface of the water<br>are supposed by Natives to do much damage to the crop. Dr. Q. Watt,<br>in a recent paper on Adhatoda Vasica, has shown that the leaves and twigs<br>of that plant are applied to rice land, not only as a green manure, but<br>also for the purpose of killing the aquatic weeds, which would otherwise<br>greatly injure the crop. He writes, ° The natives pointed to fields that had<br>been treated in this way; and there could be no mistake that these were<br>clean or free from the green scum caused through floating duck-weeds.<br>(Lemnas) and submerged <b>Charas</b> " ( <i>Select, from the Rec. of the Govt. 0</i> )<br><i>Ind., Rev. and Agric. Dept. (June 22nd, 1887), (•• 69)-</i> Dr. Watt, how-<br>ever, suggested that this antiseptic property might be extended to the de-<br>struction of the pests on other crops, such as sugar-cane, tea and coffee, be-<br>sides the weeds in the rice fields.<br>The leaf of <b>Lemma</b> has acrid properties and is employed medicinally in<br>China, being deemed cooling, diuretic, antiscorbutic, astringent and altera-<br>tive. It is used in cutaneous diseases, and as a wash for ophthalmia,<br>carbuncles, and syphilitic sores. In India the duck-weeds appear to be put<br>to no economic use, excepting with other water plants in refining sugar<br>(See Hydrilla, p. 311 ; also Saccharum officinarum). It is, however, note-<br>worthy that the members of this genus are very rich in inorganic sub-<br>stances, and have, accordingly, been recommended for use as manure. In<br>a specimen of L. minor, Herve Mangon found '—Nitrogen, 3*6; silica, 07 :<br>lime |
| ļ              | Lemon, see Citrus, Linn.; Vol. II., 333.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                | Lemon-grass and Lemon-grass oil. see Andropogon dtratus, <i>DC</i> ;<br>[Vol. I., 242-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 251            | Lendf-piplf, Dymock, Mat Med. W. Ind. <sub>s</sub> 2nd Ed., 728.<br>Dymock writes regarding an undetermined species of the Natural<br>Order PIPERACE-« employed medicinally in Bombay under the above<br>name: "Globular catkins of a species of pepper occasionally found in the<br>Bombay market, said to come from Singapore. They are of the size of<br>the pellets of sheep's dung, hence the name. The taste is very hot and<br>"iff" The individual fruits are nearly as large as cardamom seeds, the<br>whole catkin having much the appearance of a small blackberry."<br>L. 251                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| <ul> <li>LENS, Gren. et Godr.; Gen. PL, /., 525.</li> <li>Lens esculenta, Maench.; DC*&gt; Prodr., II., 366; LEGUMINOSE.</li> <li>THE LENTIL.</li> <li>SynERVUM LENS, Linn.; CICER LENS, Willd.</li> <li>*VernMasuf, HIND.; Masufi, buro-muss&amp;r, BENG.; Masur moha, ASSAM. Masilri, N. W. P.; Mohr, masur, masar, inohri, manir, chanching, kerae, maxif, PB.; Adda, dq, AFG.; Masuri di, Guz.; Misurparpur, TAM. J Misurpappu, chin sanagalu, TEL.: Masuri, chanangi, KAN.; Masuri, SANS.; Adas, ARAB.; Mirjimak, ados, PERS.</li> <li>ReferencesRoxb., FLInd, Ed. C.B.C., 567; Stewart, Pb., PI, 68; DC, Origin Cut. PL, 107, 321; Elito, FI. Andhr, 42; Aichison, Box, Afgh. Del. Comm., in Trans. Linn. Soc.,2nd Ser, III.; FL I, 49; U. C.Duti, M. Mc. Hell, 70; JULIA, SOB, 694; Dubie &amp; Fuller, Field and Garden Crops, IL, ij, PI, xxx; Bird-wood, Bomb. Pr., tig. Royle, III., Him. Boi, 200; Church, Food Grains of India, 135, 25; Balfour, Cyclop., II., 700; Smith, Die, 243; Agri-Hort. Soc. Gudia,—Pransactions, J., 411; Bengd, 1868, App. xxvii, Ixxxii, C.L., 1668, Statement I. Onartic, S., 1997, Will, 200; Churq, Food Grains of India, 135, 12; Balfour, Cyclop., II., 700; Smith, Die, 243; Agri-Hort. Soc. Gudia,—Pransactions, J., 411; Bengd, 1868, App. xxvii, Ixxxii, C.L., 1668, Statement I. Onartic, C.S., 607; Nuray, 1985, 56, 1868, 57, 1887-88, App. Will; Bengd, 1868, App. xxvii, Ixxxii, Car., 1668, Statement I. Onartic, C.S., 607; Nuray, 197; Baildour, Cyclop., N.W. P., J., 80; YV, Ixxi; Oudi, IL, 528; Panjdb, Ludhi, and 140; Gurgeon, 84, 499; Monitgomery, 107; Ladner, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Ladner, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84, 90; Monitgomery, 107; Lahore, 9; Madras, Ma., 140; Gurgeon, 84,</li></ul>                                                                                              | The Lentil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (J. Murray^                                                                                                                                                                                                                                                                                                                                                                                                              | LENS<br>esculentar. |
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| <ul> <li>252</li> <li>252</li> <li>252</li> <li>252</li> <li>252</li> <li>252</li> <li>252</li> <li>253</li> <li>254</li> <li>254</li> <li>254</li> <li>254</li> <li>255</li> <li>254</li> <li>255</li> <li>254</li> <li>255</li> <li>254</li> <li>254</li> <li>255</li> <li>254</li> <li>255</li> <li>254</li> <li>255</li> <li>255</li> <li>254</li> <li>254</li> <li>255</li> <li>255</li> <li>255</li> <li>255</li> <li>255</li> <li>256</li> <li>256</li> <li>256</li> <li>256</li> <li>257</li> <li>257</li> <li>258</li> <li>258</li> <li>252</li> <li>253</li> <li>254</li> /ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | LENS, Gren. et Godr.; Gen. PL, /., 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 25.                                                                                                                                                                                                                                                                                                                                                                                                                      | 3                   |
| <ul> <li>THE LENTIL.</li> <li>SynERVUM LENS, Linn; CICER LENS, Willd.</li> <li>*VernMasud, HIND.: Masufi, buro-mussér, BENG.; Masur moha, ASMM: Masifi, NW. P.; Molr, masur, masur, induri, manuri, chananin, KAN.; Masura, SANS.; Adas, ARAB.; Mirjumak, ados, PERS.</li> <li>ReferencesRoch. Fl.Ind, Ed. C.B.C., 567; Stewart, Pb., PL, 68; DC, Origin Cut. PL, 107, 321; Elitol, FL Andhr., 42; Aitchson, Bot. Afgh. Det. Comm. in Prans. Linn. Soc.2nd Ser., 111, FL 7, 12, 90; C.Dati, Mat. et al. 2007, Phys. Ref. 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017, 2017,</li></ul>                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                          | 252                 |
| <ul> <li>*Vern.—Masuf, HIND.; Masufi, buro-muss&amp;r, BENG.; Masur moha, ASSAM; Masilri, NW. P.; Mohr, masur, masar, tnohri, manhri, chanching, kerae, maxtri, PB.; Adad, ad ag, AFG.; Masuri ddi, Guz; Misurpurpur, TANJ. Misur-pappu, chin sanagalu, TEL.; Massur, chanangi, KAN.; Masura, SANS.; Adas, ARAB.; Mirjunad, ados, PEKS.</li> <li>References.—Roxb., Filnd., Ed. C.B.C., 567; Stewart, Pb., PL, 68; DC Origin Cult. Pl., 107, 321; Elliot, FL Andhr, 42; Aitchison, Bot. Afgh. Del. Comm., in Trans. Linn. Soc.,2nd Ser., III., Ft. I., 49; U. C.Datt, Mat. Med. Hind., Jog; Bent. &amp; Trim., Med. PL, 76; Murroy, PL and Drugs, Sin A, 120; WiatU Diet, of Chemistry, HL, 570; Baden Powell, Pb. Fr., 247; Atkinson, Hum. Dist., 308,694; Duthie &amp; Fruller, Field and Garden Crops, II., 13, PI. xxx; Bird-wood, Bomb. Pr., itg; Royle, III. Him. Bot., 200; Church, Food Grains of India, 138, 125; Balfour, Cyclop., IL, 700; Smith, Die, 243; Agri-Hort. Soc. ofInd.:—Transactions, I., 411; W., 101; Y., 64; Journals (Jd SS, Statement I.; Quartery-Journ. of Agric, Y., 63; Special Reports from J. B. Fuller, Esq., C.S., Cent. Flow; Dir. Land Rec. &amp; Agric, Bangal; Dir. Land Rec., &amp; Agric, Statement I.; Quartery, Journ. of Agric, Y., 63; Special Reports from J. B. Fuller, Esq., C.S., Cent. Flow; Dir. Land Rec. C. &amp; Agric, Bangal; Dir. Land Rec., &amp; Agrid, Bangal; Dir. Jand, Bangal; Dir. Janda, Jang</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <ul> <li>ASSAM: Masilri, NW. P.; Mohr, masir, masar, thohri, manhri, chanching, kerae, mastri, PB.; Adah, ad ga, AFG; Masuri ddt, Guz.; Misurpurpur, TAM.J. Misurpapu, chin sanagalu, TEL.; Massur, chanangi, KAN.; Masura, SANS; Adax, ARAB.; Mirjumak, adas, PERS.</li> <li>References.—Rotb., F.I.Ind., Ed. C.B.C., 567; Stewart, Pb., PL, 68; DC, Origin Cutt. P1, 107, 321; Elliot, FI. Andhr., 42; Atichison, Bot. Afght. Del. Comm., in Trans. Linn. Soc., 2nd Ser., 111, 570; Baden Powell, Pb. Pr., 247; Atkinson, Him. Dist., 308, 694; Duthie &amp; Fuller, Field and Garden Crops, II, 13; PL xxx:, Bird-wood, Bomb, Pr., ig; Royle, 111, Him. Bot., 200; Church, Food Grains of India, i384, 52; Balfour, Cyclop, II, 700; Smith, Die 243; Agrit-Hort, Sco. glnd.:—Transactions, J., 41; IV., 107; V., 64; Journals (Old Series), V., Set, 30; IX., 416; Reports of Agnc. Dept., Bombay, 1885-56, 1886-87, 1887-88, App. viii. : Bengal, 1886, App. xviii, Ixxii: C. P., 1655, Statement I.; Quartery Journ. Of Agric, V., 63; Special Reports; Fom J. B. Fuller, Esq., C.S., Cent. Piov.; Dir. Land Rec. &amp; Agric, Basean; Govt. Gi Burma; Gazetteers: —Bombay, XVI., Vo; XVII, 269; NW. P., 1, 80; IV., Ixxii; C. P., 1685, Statement I.; Quartery Journ. Of Agric, V., 50; Montgomery, 107; Lahore, 9; Madras, Man. of Administration, I., 289.</li> <li>Habitat.—A valuable pulse, grown as a winter crop all over India. DeCandolle writes: "The lentil appears to have existed in western temperate Asia, in Greece, and in Italy, where its cultivation was first undertaken in very early prehistoric times, when it was introduced into Egypt. Its cultivation appears to have extended at a less remote epoch, but still hardly in historic times, othen it was introduced into Egypt. Its cultivation appears to have extended at a less remote epoch, but still hardly in historic times, when it was introduced into Egypt. Its cultivation appears to have extended in the East, suphnese mentions it as an article of food of the poor among the Greeks, by whom it was known as "Safoc</li></ul>                                                                                                           | Syn.—ERVUM LENS, <i>Linn.;</i> CICER LENS, <i>Willd</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| <ul> <li>Origin Cult. PL, 107, 321; Elliot, FL Andhr., 42; Aitchison, Bot Algh.</li> <li>Del. Comm., in Trans. Linn. Soc.,2nd Ser., III., Ft. I., 69; U. C.Dut, Mat. Med. Hind., 30g; Bent. &amp; Trim., Med. PL, 76; Murray, PL and Drugs, Sin A, 120; WiatU Diet, of Chemistry, HL, 370; Baden Powell, Pb. Pr., 24r; Atkinson, Him. Dist., 308,694; Duthie &amp; Fuller, Field and Garden Crops, II, 370; Xux; Birdwood, Bomb. Pr., tig; Royle, III. Him. Bot., 200; Church, Food Grains of India, 138,f. 23; Balfour, Cyclop, II, 700; Smith, Die, 243; Agri-Hort. Soc. ofnds:—Transactions, I., 41; IV., 10T; V., 64; Journais (Old Series), V., Sci., 30; IX, 416; Reports of Agric, V., 64; Journais (Old Series), V., Sci., 30; IX, 416; Reports of Agric, V., 63; Special Reports from J. B. Fuller, Esq., C.S., Cent. Flow; Dir. Land Rec. &amp; Agric, Bengal, Dir. Land Rec. &amp; Agric, Bengal, Dir. Land Rec. &amp; Agric, Bengal, Jundhi-ana 140; Gurgeon, 84; Hoshiarput, 91; Smita, 37, Musafargark, 95; Kornal, 172; Settlement Reports—C. P., Nimar, 197; Balitul, 62; Chanda, 81; Narsinghur, 52; Panjdb,Simila, App. II, xxxix; Haeara, 85; Kangra, 24; Jinans, 84, 90; Montgomery, 107; Lahore, 9; Madras, Man. of Administration, 1, 289.</li> <li>Habitat.—A valuable pulse, grown as a winter crop all over India. DeCandolle writes: "The lentil appears to have existed in western temperate Asia, in Greece, and in Italy, where its cultivation was first undertaken in very early prehistoric times. According to Herodotus, Theoophrastus, and others, the Egyptians used it largely. The ancient Jews also employed it to a considerable extent as an article of food, but still hardly in historic time, both east and west, that is, into Europe and India." The lentil has been cultivated in the East, in the Mediterranean basin, and in Switzerland, from prehistoric times. According to Herodotus, Theoophrastus, and others, the Egyptians used it largely. The ancient Jews also employed it to a considerable extent as an article of food, but hueldes wing probably formed Esau's mess of</li></ul>                                                                                           | ASSAM; Masilri, NW. P.; Mohr, masur, masa<br>, chanching, kerae, maxtri, PB.; Adah, ad as, AFG.;<br>Misurpurpur, TAM.J Misur-pappu, chin sanagal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ur, tnohri, manhri,<br>Masuri dót, Guz.;<br>u, TEL.; Massur,                                                                                                                                                                                                                                                                                                                                                             |                     |
| DeCandolle writes: "The lentil appears to have existed in western temperate Asia, in Greece, and in Italy, where its cultivation was first under-<br>taken in very early prehistoric times, when it was introduced into Egypt. Its cultivation appears to have extended at a less remote epoch, but still<br>hardly in historic time, both east and west, that is, into Europe and India."<br>The lentil has been cultivated in the East, in the Mediterranean basin, and<br>in Switzerland, from prehistoric times. According to Herodotus, Theo-<br>phrastus, and others, the Egyptians used it largely. The ancient Jews<br>also employed it to a considerable extent as an article of food, the hulled<br>pulse having probably formed Esau's mess of red pottage. Aristophanes<br>mentions it as an article of food of the poor among the Greeks, by whom<br>it was known as "<\$a)cof." By the Latins it was known and used under<br>the name of "lens," the derivation of which is doubtful, but the dissimi-<br>larity of the Latin and Greek words show that the species probably existed<br>wild in each country before it was cultivated. Another proof of its ancient<br>existence in Europe is the fact that lentils have been found in the lake-<br>dwellings of St. Peter's Island, Lake of Bienne, which are of the bronze<br><b>age {DeCandolle</b> }.<br>From a consideration of the Sanskrit, Persian, and Arabic names of<br>the lentil, and the evident connection of most local Indian names with these,<br>DeCandolle arrives at the opinion that the plant was not known in India<br>before the invasion of the Sanskrit-speaking races.<br><b>Cultivation.</b> —The lentil is at the present day cultivated in all parts<br>of helic arrively in the Greet Deriver and Madues. For environment                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul> <li>Origin Cult. PL, 107, 321; Elliot, Fl. Andhr., 42; A Del. Comm., in Trans. Linn. Soc.,2nd Ser., III., Fd Mat. Med. Hind., 30g; Bent. &amp; Trim., Med. PI., 76 Drugs, Sin A, 120; WtatU Diet, of Chemistry, HI., Pb. Pr., 24r; Atkinson, Him. Dist., 308,694; Dutl and Garden Crops, II., i3, PI. xxx.; Bird-wood, Bo. III. Him. Bot., 200; Church, Food Grains of India, Cyclop., II., 700; Smith, Die, 243; AgriHort. Soctions, /., 41; IV., IOT; V., 64; Journals (Old Seriel, 416; Reports of Agric, Dept., Bombay, 1885-S6, 188 viii. : Bengal, 1886, App. xxvii., Ixxii.; C. P., 1685, terly-Journ. of Agric, V., 63; Special Reports from C.S., Cent. Piov.; Dir. Land Rec. &amp; Agric, Beng &amp; Agric, Assam; Govt. of Burma; Gazetteers: —E XVII., 269; NW. P., /., 80; IV., Ixxi.; Oudh, I., 5, ana 140; Gurgaon, 84; Hoshiarput, 91; Simla, \$7, Kornal, 172; Settlement Reports:—C, P., Nimar, Chanda, 81; Narsinghpur,52; Panjdb,Simla, App. 88; Kangra, 24; Jhang, 84, 90; Montgomery, 107;</li> </ul>                                                    | itchison, Bot. Afgh.<br>, I., £9; U. C.Dutt,<br>; Murray, PI. and<br>\$70; Baden Powell,<br>nie & Fuller, Field<br>mb. Pr., tig; Royle,<br>138,f. 2\$; Balfour,<br>c. ofInd.:—Transac-<br>s), V., Sel., 30; IX.,<br>6-87, 1887-88, App.<br>Statement I.; Quar-<br>J. B. Fuller, Esq.,<br>val; Dir. Land Rec.<br>Sombay, XVI., WO;<br>28; Panjdb, Ludhi-<br>' Musaffargark, 95;<br>197; Baitul, 62;<br>U. xxxix.; Haeara. |                     |
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| of India approxibility in the Control Drovin and Madron. For convenience I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | the lentil, and the evident connection of most local Indian<br>DeCandolle arrives at the opinion that the plant was no<br>before the invasion of the Sanskrit-speaking races.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | names with these,<br>t known in India                                                                                                                                                                                                                                                                                                                                                                                    | CULTIVA-<br>TION    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | of India, especially in the Central Provinces and Madras.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | For convenience                                                                                                                                                                                                                                                                                                                                                                                                          |                     |

| LENS                       | Cultivation of the Lentil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| sculenta <sup>•</sup>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| CULTIVA-<br>TION.          | of description the methods pursued, amount of seed used, area under the crop, &c, may be detailed under the headings of the various Provinces from which trustworthy information is available :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Panjab. 1<br><b>254</b>    | <i>The Panjdb.—It</i> is commonly cultivated all over this Province, and is said to be grown as high as 5,500 feet on the Chenab, and in parts 01 Ladak at 11,500 feet. The following remarks, extracted from the Settlement Report of the Jhang District, may be taken as typical of the methods in general use throughout the Province :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                            | <sup>if</sup> Area under cultivation 2,404 acres. <i>Massur</i> is a <i>sailaba</i> (inundation, crop, and is never sown on other soils. Either new alluvial soils, or light lands that are not good enough for wheat, are selected. <i>Massur</i> is often the first crop sown on new <i>sailab</i> lands, or it may follow <i>mattar</i> (Lathyrus <b>sativa</b> ). The land is ploughed once or twice, and the seed is sown broadcast. One ploughing takes place after the seed is sown. <i>Maggan-Poh</i> (December-January) are the months for sowing, from 1 to \\panapis^vkanal (or30te <b>45ft</b> of seed per acre) being the amount used. The crop ripens in the enc of <i>Chait</i> and the beginning of <i>Baisdkh</i> (March-April). It is reaped, noi pulled. The yield is light, and the crop is subject to much the same in juries as gram ( <b>Cicer arietinum</b> ), the pods being attacked by caterpillars Rain, wind, and thunder are hurtful when the plant is in flower. "During the past five years the acreage under the pulse has been returned as follows :—1884-85, 170,975 acres; 1885-86, 100,820; 1886-87, 142> <sup>121</sup> 1887-88,146,931; and 1888-89, 159,461 acres. |
| NW. Prov-<br>inces.<br>255 | <i>North-West Provinces.—The</i> following account of the method pursuec<br>in these Provinces is given by Messrs. Duthie & Fuller:—" Lentils an<br>grown as a cold-weather crop under much the same conditions as peas. J*<br>the Tarai district the area under them constitutes nearly 7 per cent, of tx<<br>total <i>rabi</i> cropped area; in the Rohilkhand Division it amounts to 2 pe<br>cent., and in the districts of the Benares Division to 1*3 per cent. In n<<br>other division does it reach so high a proportion as 1 per cent., being nex<br>largest in the Meerut and Allahabad Divisions (08 to 07 per cent.), an<<br>smallest in the Agra and Jhansi Divisions (o'l to 0*3 per cent.), whici<br>together comprise the driest tract in the Provinces. Taking the thirty tem<br>porarily-settled districts as a whole, <i>mastr</i> is grown on almost exactly 1 p <sup>e</sup><br>cent, of the total <i>rabi</i> cropped area.                                                                                                                                                                                                                                                           |
|                            | It is grown on all kinds of soils, but chiefly in low-lying land. It i comparatively seldom grown after an autumn fallow, but most commonl follows early rice. It is often sown while the rice stalks are standing, an allowed to grow up amongst them. Three ploughings are as a rule suft cient.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                            | The quantity of seed per acre varies with the condition of the grounc<br>but is commonly about 1 maund. The average produce from unirri<br>gated land is from 6g to 8 maunds of grain, but with irrigation from 10 t<<br>12 maunds would not be an excessive outturn. The average area und*,<br><i>mastir</i> in the thirty temporarily-settled districts as deduced from the agn<br>cultural returns of 1878-79-80 was 15,961 acres irrigated, and 98,264 <sup>aC</sup> f <sup>e</sup><br>dry, giving a total of 114.225 acres, of which much the largest prope>ttiof<br>a total of 42,388 acres, was in Rohilkhand." The acreage during the pa-<br>five years has been as follows: — 1884-85, 137,597; 1885-86, 140M <sup>0</sup><br>1886-87,169,832; 1887-88, 169,949; 1*88-89, not received.                                                                                                                                                                                                                                                                                                                                                                                                           |
| Provinces.<br>256          | <i>Central Provinces.</i> —*). B. Fuller, Esq., C.S., reports as follows :-<br><sup>11</sup> Ervum Lens is grown throughout the Provinces as a <i>rabi</i> or cold-weathe<br>crop. Its cultivation is larger in the Narbadda Valley, the Satpura Dil<br>tnct, and Chhattisgarh. In the Nagpur country it is less popular.<br><b>L. 256</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| Cultivation of the Lentil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ( <b>J.</b> Murray.)                                                                                                                                                                                                                                                     | LENS<br>esculenta.    |
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| area under <i>masúr</i> in each division during the last two<br>below:—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                          | CULTIVA-<br>TION.     |
| Jabalpur Division       1885-86.         Narbadda       70*984         Nagpur       65,864         Chnattisgarh       7,090         •       32,869         TOTAL       226,807                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1886-87.<br>Acres.<br>7&840<br>69,669<br>7,080<br><del>- 108,113</del><br>264,702                                                                                                                                                                                        |                       |
| (In the last two years the crop has been considerably<br>88 the total acreage was only 203,417; and in 1888-89, 18<br>The crop is generally grown on the best black soil; in<br>of $\nasur$ on black soil may be accepted as an indicatio<br>of first quality. A curious fact connected with its cultivatio<br>is that the Santami <i>chamars</i> , who form an important se-<br>cultural community of that tract, decline to have anything<br>he ground that in its red colour it resembles flesh."<br><i>Berar.</i> —The crop is grown to a small extent in this p                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 86,460.)<br>ideed, the growth<br>on that the land is<br>on in Chhattisgarh<br>ection of the agri-<br>to do with it on<br>province, the area                                                                                                                              | Berar.                |
| during the past five years having- averaged between 20 acres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                          | 257                   |
| <i>Bengal.</i> —The following is extracted from the Report<br>of Land Records and Agriculture:—"There are two va-<br>Lens grown in Dacca; one is the Patna variety, and the<br>in Lower Bengal. The plants of the latter are bushy a<br>putturn. It does best in clay soil, as in very light soil<br>away. It comes after <i>neah</i> or <i>kele kartiksal</i> paddy, an<br>paddy. Three or four ploughings suffice. It should be<br>and is fairly dry, owing to the fact that, if too much mo<br>the plants shoot up quickly, but afterwards make no progr<br>Five seers of seed are sown per <i>big ha</i> , from the middle<br>the end of November, and barley is sometimes sown mi<br>harvested in February-March, and yields from 3 to 4 mau<br>In the Bhagulpore Division one or two ploughings<br>harrowings are considered sufficient; the seed is sown in<br>ber, and the crop reaped in March-April. Lentils are also<br>imited extent in Chutia Nagpur, and in the Behar Distr<br>of about 2 per cent, of the winter-sowings." | other is met with<br>and give a better<br>the plants wither<br>ad is followed by<br>e sown when the<br>isture be present,<br>ress.<br>e of October up to<br>ixed with it. It is<br>inds.<br>and one or two<br>October-Novem-<br>o grown to a very<br>ricts to the extent | Bengal-<br><b>258</b> |
| <i>Bombay.</i> —In Bombay the lentil crop is a very unimpared with other Jpulses. As in other districts, it is sown harvested in February, and a small quantity is annually from the area in which it is chiefly grown, namely, Nåsik. Reports of the Director of Land Records and Agricultu 1887-88, it would appear that the average area under these three years, was 18,323 acres. In 1888-89 it was of By far the largest proportion of this was in Nåsik, which area of 9,562 acres or more than halt Belgaum had 5, 1,527, and Satara 721 acres. No statistics are available regarding the amount of se or profit per acre.                                                                                                                                                                                                                                                                                                                                                                                                        | n in October and<br>sent to Bombay<br>From the Annual<br>ure for 1885-86 to<br>the crop, during<br>only 18,002 acres.<br>h had an average<br>139 acres, Poona                                                                                                            | Bombay.<br>259        |
| <i>Madras.</i> —No accurate information is available reg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | arding this Prov-                                                                                                                                                                                                                                                        | Madras. 260           |
| ince. In 1886-87 101,473 acres were returned as under<br>that date Lens esculenta has not figured in the returns.<br><i>Assam and Burma</i> —The lentil is said to be grown in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1                                                                                                                                                                                                                                                                        | 200                   |

| LENS<br>esculenta. | Medicinal and Other Uses of Lentils.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CULTIVA-<br>TION.  | A consideration of the preceding reports and extracts shows that the crop is universally a cold weather one; that it is especially suited to rich, moist, low-lying soils; that with a fair amount of seed (about 1 maund) it yields from 6 to 8 maunds an acre, and if irrigated 10 to 12 maunds; and that the soil requires little preliminary working, and the crop little after-attention.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                    | Church remarks that the yield might be increased if more pains were<br>taken in the selection of seed for sowing, since there are some varieties of<br>the lentil, which produce seed weighing twice as much as the small com-<br>mon sort, and which, notwithstanding this, do not make a proportionately<br>increased demand upon the resources of the soil. The total area under the<br>crop in the districts from which statistics are forthcoming averages be-<br>tween 6co,oco and 750,000 acres, but these figures do not include Bengal,<br>Oudh, Burma, Assam, Central India, and the Native States.                                                                                                                                                                                                                                                                             |
| medicine.<br>262   | Medicine.— Lentils have long held the reputation of being useful medi-<br>cinally in cases of constipation and other intestinal affections. It is prob-<br>able, however, that they have no special value in such cases. In the form<br>of a paste or poultice, the pulse is used as an application to ulcers occur-<br>ring after small-pox.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    | SPECIAL OPINIONS.—§" I have found lentils of great use in the treat-<br>ment of chronic and obstinate constipation " {Surgeon-Major C. W. Cal-<br>throp, M.D., Morar). "A paste prepared from the seeds is a useful cleans-<br>ing application in cas*s of foul and indolent ulcers " (Assistant Surgeon<br>T. N. Ghose, Meerut).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| FOOD.<br>263       | Food.—The lentil, as already indicated, is a food of the greatest anti-<br>quity, and has for many centuries been much prized by the natives of most<br>Eastern countries. In Egypt, Syria, and other Eastern countries it is<br>parched and eaten at the present day, and is considered one of the best<br>foods for those who undertake long journeys. In India it is eaten as <i>ddl</i> ,<br>flavoured with various aromatics and carminatives, also as a component<br>part of the dish called <i>kichri</i> , and is considered the most nutritious of the<br>pulses. If too freely indulged in, however, it is supposed to be heating and<br>apt to give rise to eruptions. The young pod is also occasionally eaten as<br>a vegetable, and the dry leaves and stalks are employed as a fodder for<br>cattle.<br>The ground pulse mixed with a little flour of barley or some other |
|                    | cereal, and common salt, is sold in Europe, under the names of Ervalenta<br>or Revalenta, as a food for invalids.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CHEMISTRY. 264     | CHEMICAL COMPOSITION.—Church gives the following as the aver-<br>age composition :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                    | IN 100 PARTS.<br>Husked. With husk.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                    | Water.         n-8         117           Albumenoids         2 5 * 1         24"9           Starch         584         56*0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                    | Oil · · · · · · · · · · · · · · · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                    | Ash. $2 \cdot 2 \cdot 3$<br>The same authority writes: "The nutrient ratio is 1 : 2*5, and the nutri-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                    | ent value 87. The lentil is generally regarded as a pulse of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | class, inferior to <i>mung</i> (Phaseolus Mungo), but equal to <i>urhur</i> , the pigeon-<br>pea. It is highly nutritious, but somewhat heating; it should be carefully                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | freed from the husk or coat. The bitter substance which occurs in lentils<br>may be removed by soaking them for a short time in water in which a little                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                    | carbonate of soda (common washing soda) has been dissolved. The meal of lentils, deprived of their coat, is of great richness, containing generally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 4                  | more albumenoid or flesh-forming matter than bean or pea-flour/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

of lentils, deprived of their coat, is of great richness, containing generally more albumenoid or flesh-forming matter than bean or pea-flour/P

L. 264

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IDAGATHIS                                          |
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| ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <u>cristata.                                  </u> |
| Other chemists have obtained analyses differing to some degree, from<br>that given by Church, especially in the percentage of starch. Thus ac-<br>cording to Krocken the air-dried seed contains from 34 to 35 per cent, of<br>starch; Fresenius found 35*5 per cent., and 7 per cent, of gum, and<br>Poggrale 44 per cent, of the two combined. Boussingault found the air-<br>dried straw to contain 27 per cent, of water, 57 per cent, of woody fibre<br>and <i>yc</i> per cent, of ash, which was found to contain a large percentage of<br>lime, potash, silica, and phosphoric acid ( <i>Watts, Dictionary of Chemistry</i> )<br>Trade.—A considerable trade is carried on in the lentil, but since the<br>returns <30 not specify the various pulses separately, it is impossible to<br>gi\^ separate figures regarding this species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TRADE,                                             |
| • <b>LEONOTIS,</b> $Br.$ ; Gen. $Pl_t$ , $II.$ , 1214.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                    |
| <ul> <li>(/. 867; LABIAT2E.</li> <li>Leonotis nepetefolia, Br. ; Fl. Br. Ind., IV., 6gi; Wight, Ic,<br/>Syn.—PHLOMIS NEPET^FOLIA, Linn.; LEONURUS GLOBOSUS, Mcench.</li> <li>Vern.—Hejurchei, BENG.; Dare dhompo, janum dhompo, SANTAL; Mdti-<br/>jer, mdttsul, BOMB.; Dipmal, MAR.; Rana bheri, beri, mulugolimidi,<br/>hanumanta bira, TEL.; Maha-yakwan-assa, SING.</li> <li>References.—Roxb., Fl. Ind., Ed. CB.C, 461; TWmaites, En. Ceylon<br/>PL, 241; Dale. &amp; Gibs., Bomb. FL, 211; Grah., Cat. Bomb. PL, tS3 /<br/>Elliot, FL Andhr., 25, 26, 68, 119, i63; Campbell, Ec. Prod., Chutia<br/>Nagpur, No. 8487 / Dymock, Mat. Med. IV. Ind., 611; Year Book of<br/>Pharmacy, T850, 250; Atkinson, Him. Dist., 376"; Indian Forester, XII.<br/>(app.), 19; Gazetteers :— NW. P., I., 83; IV., Ixxvi.</li> <li>Habitat.—A tall annual shrub, found cultivated and naturalized, but<br/>doubtfully indigenous, throughout the hotter parts of India, from the Pan-</li> <li>jab to Travancore and Singapore, also in the drier regions of Ceylon.<br/>Medicine.—Campbell states that in Chutia Nagpur the ash produced<br/>by burning the FLOWFR-BUDS is applied to burns and scalds, and Dymock<br/>writes that in Bombay the ash of the FLOWER-HEADS mixed with curds is<br/>applied to ringworm and other itchy diseases of the skin.</li> </ul> | MEDICINE.<br>Flower-buds.<br>267<br>Flower-heads.  |
| Leontodon Taraxacum, Linn. ; see Taraxacum officinale, Wigg.;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 268.                                               |
| LEONURUS, Linn.; Gen. PL, II., 1210.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                    |
| Leonurus Sibiricus, Linn. ; Fl. Br. Ind, IV., 678 ; LABIATJE.<br>Syn.—L. TARTARICUS, Burnt.; L. HETEROPHYLLUS, Sweet; STACHYS<br>ARTEMESIE, Lour.<br>Vern.—Gúma, PATNA.<br>References.—Roxb., FL Ind., Ed. C.B.C., 461 ; Burnt. FL Ind., 127;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 269                                                |
| Irvine, Mat. Med. Patna, 129.<br>Habitat.—An annual, erect, leafy stout herb, occurring on the plains of<br>India from Bengal and Sylhet to Coorg, doubtfully indigenous.<br>Medicine.—Irvine writes: <sup>if</sup> The ROOT, LEAVES, and JUICE are bitter,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MEDICINE.                                          |
| and used as a febrifuge. Dose 2 drachms to 2 ounces in infusion; price 1 anna per pound."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Root.<br>270                                       |
| Leopards, see Tigers ; Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Leaves.                                            |
| LEPIDAGATHIS, Willd.; Gen. PL, II, not.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 271                                                |
| [ACANTHACEJE.<br>Ljepidagathis cristata, Willd.; Fl. Br. Ind., IV., JI6;<br>Syn.—L. SHUTERI, T. Anders.; L. SP., n. 18; Herb. Ind. Or. H.f <sub>%</sub> &7.<br>Var. rupestris, with pubescent elliptic leaves and stems; L.IRUPESTRIS<br>Nees.<br>Vern.—Ot dhompo, SANTAL; Koli-che*h&tar <sub>2</sub> BOMB.; Bhui terada, MAR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Juice.<br>272<br><b>273</b>                        |
| 40 L- 273                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                    |

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| LEPIDIUN<br>Iberis.                       | M The Pepper Grass or Pepperwort.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| MEDICINE.<br>Ash.<br>274<br>Plant.<br>275 | <ul> <li>References.— Roxb., Fl.Ind., Ed. C.B.C., 476; DaU., &amp; Gibs., Bomb.<br/>Fl., 191; Dymock, Mat. Med. W. Ind., 2nd Ed., \$94; Campbell, Be.<br/>Prod., Chutia Nagpur, No. 7862; Gazetteers:—Bombay, V., 27:<br/>W.P.,1.,83; IV.,lxxvi.</li> <li>Habitat.—A common plant on dry, elevated barren ground, in Cora-<br/>mandel.<br/>Medicine.—Campbell states that the ASH of the burned plant is em-<br/>ployed in Chutia Wagpár as an application to sores. Dymock, remarks<br/>that it is applied to cure itchy affections of the skin, and that the PLANT<br/>is considered a good bitter for administration in fevers.</li> <li>gr<br/>SPECIAL OPINION.—§ "The plant is considered to be a bitter tonic<br/>{Surgeon-Major C. T. Feters, South Afghanistán).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                           | LEPIDIUM, Linn.;. Gen. PL, /., 87.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 276                                       | Lepidium Draba, Linn.; Fl. Br. Ind., /., 160; CRUCIFER*.<br>Syn.—L. CHALEPENSE, Schrenk.; L. RE PENS, Boiss.<br>Vern.—Bijindak, AFGH.; Busk, QUETTA.<br>References.—Boiss, Fl. Orient., I., 356; Aitchison, Bot. of Afgh. Del.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| FOOD&<br>FODDER.<br>Leaves.<br>277        | Com., in Trans. Linn. Soc, 2nd Series, III., Pt. I., 36.<br>Habitat.—A common weed of cultivation in the °anj£b <sub>y</sub> distributed<br>westwards, through Afghanistan and Baluchistan to Europe.<br>Food and Fodder.—The LEAVES are largely collected and eaten as a<br>pot-herb by the inhabitants of Afghanistan and Baluchistan. It is one of<br>the principal spring fodder plants of Quetta for cattle and horses (see Fod-<br>der, Vol. III., 415).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 278                                       | L, Iberis, <i>Linn.; DC, Prodr., /., 207.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MEDICINE.<br>Seeds.<br>279                | THE PEPPER GRASS or PEPPERWORT.<br>References.—Dymock, Mat. Med. W. Ind., 55: Pharmacog. Indica, I., ri8.<br>Habitat.—A herb of which the indigenous area extends from Southern<br>Europe to Siberia.<br>Medicine.—Dr. Dymock and the authors of the Phartnacographta<br>Indica describe the medicinal SEEDS, called towdti, as products of this plant.<br>The origin of these seeds, which are imported into Bombay from Persia, ha*<br>for long been a subject of dfscussion. By some English writers they have<br>been attributed to Malva sylvestris, by others to Cheiranthus Cheiri, but<br>Dymock has pointed out that, owing to the nature of the fruit, neither of<br>these suppositions can be correct. Again, Stewart states that in the Pan-<br>jab and Sind Matthiola incana, R. Br., is valued for its seeds, which consti-<br>tute one of the several kinds of todri* The authors of the Pharmacogra-<br>phia Indica commenting on this write: "In short this Persian name ap-<br>pears to have much the same meaning as the Xevxhiov of the Greeks, being<br>applied loosely to several Spring flowers." Dr. Dymock, however, has<br>arrived at the conclusion that at least." some of the towdri seed is doubt-<br>less the produce of L. Iberis, Linn." *<br>Mir Muhammad Husain described the seeds and the plant which<br>was supposed to yield them, and believed them to be "hot in the second<br>ucgree, and moust in the natic; some say gry. rroperties approximation<br>fattening the body and purifying the blood." Commenting on this Dy-<br>mock writes: "The drug is in general use for the above-mentioned proper-<br>ties, which are attributed by the natives to most of the cruciferous seeds"<br>Again, in describing the properties of L. Iberis, he writes: "This plant<br>was known to the ancients and employed as a rubefacient in rheumatism;<br>the seeds taken internally were prescribed in rheumatism and dropsy. Ac-<br>cording to Pliny they were first used by Damocrates. Corre and<br>L. 279 |

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| The Cress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (J. Murray!)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | LEPIDIUM<br>sativum. |
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| Lejanne state that the plant is called 'Cresson de Sa<br>and is considered to have all the properties of water-<br><i>Towdn'</i> seeds as imported into Bombay are of thr<br>(called white); "red;" and "dark red" or "brow<br>black <i>tovjdri</i> ). When soaked in water they becom<br>mucilage.<br>It appears from the descriptions in the works a<br>Borgion 't two drill soads have not been even incd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -cress."<br>ee kinds—" pale red <sup>9</sup><br>n " (sometimes called<br>me thickly coated with<br>above quoted that the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MEDICINE.            |
| Persian <i>' touodri</i> " seeds have not been examined<br>examination might in all probability result in the e<br>their origin, or at least would prove the correctnes<br>Dymock's opinion. The flowering tops and see<br>analysed by Leroux in 1837, <sup>a</sup> d found to yield a<br>phous bitter principle which that chemist named •<br>a sulphuretted volatile oil ( <i>Pharmacographia Ind</i><br>be proved to exist in <i>towdn</i> , Dr. Dymock's opinion<br>confirmed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | xact determination of<br>s or otherwise of Dr<br>ds of L. Iberis were<br>a characteristic amor-<br>'Lepidin " along with<br>lica). Should lepidir                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |
| Lepidium latifolium, Linn./ Fl. Br. Ind., I., A<br>Vem.—Gonyuch, LA DAK.<br>References —Stewart, Pb. Plants, List of On<br>Afgh. Del. Com., in Trans Linn. Soc, 2nd Seri<br>Book of Pharmacy, 1874, 622.<br>Habitat.—An erect, leafy herb, abundant in Wes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | nissions; Aitckison, Bot<br>ies, III., Pt. I., 36; Yea<br>tern Tibet, distributed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | r                    |
| to Europe, North and Western Asia, and North Afr<br>Medicine.—In Europe this plant is popularly b<br>antiscorbutic.<br>Fodder.^Stewart states that it is browsed by<br>Ladak, but is little eaten by <i>ydks</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | believed to be a useful                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 281                  |
| <ul> <li>L. sativum, Linn ; Fl. Br. Ind., /., 159.<br/>THE CRESS.</li> <li>Vern.—Hdlim, chansaur, hurf, HIND.; Halitn, a<br/>halang, NW. P.; Shargundei, tezak, hdlim, PH<br/>liya, ahaliva, BOMB.; Ahliva, MAR.; Asdlio,<br/>D E C; Ali-verai, TAM.; Adit-yalu, adala-vitala<br/>Allilija, KAN.; Mong-nyin% sa-mung-nee, BURM<br/>rika, SANS. 5 Jarjir, hurf, half, reschad, ARAH<br/>towdri, seeds=tukhme-turrahtesåk, PERS.</li> <li>References.—Stewart, Pb. PL, 14; DC. Origin O<br/>Andhr., 10; Mason, Burma and Its People, 469,<br/>/95; H'» *2 ! G'Shatighnessy, Beng. Dispens., 1<br/>five years in the East, II., 2g8; Moodeen Sheriff,<br/>Mat. Med. Madras, 24; U. C. Dutt, Mat. Med. H<br/>Mat. Med. W. Ind., 2nd Ed., 57; Pharmacog. Ina<br/>Bomb. Drugs, 11; Murray, PL and Drugs, S<br/>Med. Patna, 127; Cat. Baroda Durbar at Col.<br/>Watts, Die. ofChem., VIII., Pt. I., 584; Atkinso<br/>708; Ec. Prod., NW. P-*mt. V., i3, 39; Lisbo<br/>Birdwood, Bonib. Pr., 7, i38^Cooke, Oils and Oi<br/>on Sind; Smith, Die, 142; Agri Hort. Soc. of<br/>*95; V., 64; VII., 69; Journals {Old Series}, X<br/>IV.; 23; V.,33; 40, Sel.,5; Pro., 21; Gazette<br/>VI., 181; Mysore and Coo*g, I., 57; Bomb., VI<br/>79; IV., Ixvii.; Settlement Reports, Kumaon, Ap<br/>Habitat.—A small annual herb, cultivated througf<br/>ern Tibet, also in other parts of Eastern Asia, Europ<br/>Its origin is extremely obscure. DeCandolle write</li> </ul> | <ul> <li>3. ; Ahreo, SiND ; Asdhalim, Guz.; Halim,<br/>ddeli, ddiyalu, TEL.;</li> <li>; Chandrasura, chand-<br/>3. ; Twrah-tiekah, hdleh,</li> <li>Cult. PL, 86; Elliot, FL<br/>749 ; Ainslie, Mat. Ind.,<br/>88; Honigherger, Thirty-<br/>Supp. Pharm. Ind., 168;<br/>Hind., 115,295; Dymock,</li> <li>lica, I., 120 ; S. Arjun,<br/>ind, 47; Irvine, Mat.<br/>Ind. Exhib., No. J23;<br/>on, Him. Dist., 305,702,<br/>oa, U. PL Bomb., 145;<br/>Iseeds, 52 ; Stocks, Rep.<br/>Ind., Transactions, III.,<br/>III., 390 ; (New Series),<br/>ers :—Orissa, II., Apt.<br/>III., 183; NW. P., /.,<br/>p., 23; Lahore, rr.<br/>nout India and West-<br/>be, and North Africa.</li> </ul> |                      |

| LEPIDIUM<br><u>sativum.</u> | Cultivation of the Cress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|                             | that the plant has no known name in Sanskrit. In later Sanskrit works,<br>however, the medicinal uses of the seeds are described under the name of<br><i>Chandra sura</i> , a name probably of recent origin, since it does not appear<br>to occur in older Sanskrit works on medicine. DeCandolle enumerates<br>the localities in which the plant has been found, and concludes his remarks<br>as follows:—'' I am led to believe, by this assemblage of more or less<br>doubtful facts, that the plant is of Persian origin, whence it may have<br>spread, after the Sanskrit epoch, into the gardens of India, Syria, Greece, |

and Egypt, and even as far as Abyssinia.

Cultivation.—No statistics are available regarding the exact extent to which the cress is cultivated in India. It is, however, largely grown all over the country, not only for European consumption, but also as a pot-herb for native use. The following account of the best method.to pursue in its cultivation, quoted from Firminger's Gardening for India, may be found useful:-"Cress seed may be sown in the open ground when the rains cease in October. It is best to sow only a small quantity at a time, and to keep up a succession of sowings, at short intervals, during the cold season. As the *malts* rarely cut it for use till it is three or four inches high, it is as well to sow it broadcast, and rather thinly.

" If, however, it be required to be eaten, as is usual in England, when little more than the seed leaves are formed, it may be raised at nearly all times in the year. It is best in that case to make the sowings in  $l^{ar}$ £? shallow pans, filled with good light soil. The soil should be well watered and the seed then scattered thickly over its surface. Over a pan a covering should be placed till the seed germinates, and then be removed. In a few days the cress will be fit for cutting. In order to save seed, in the early part of the cold season, plants in the open ground at abcut six inches apart should be reserved. These by the commencement of the hot season will vield a plentiful supply of seed, which should be carefully stored away for future use."

Oil.—The SEED yields an oil, said to be very similar to that obtained from mustard seed. The only record of its preparation in India is by Lieutenant Hawkes (Report on Oils of Southern India, 37). It is described by SchUbler as brown-yellow, with a sp. gr. of 0-924, turning thick ana turbid at— $6^{\circ}$  (2i°F.) and solid at— $15^{\circ}$  (5°F.), and drying slowly. The following remarks by Lieutenant Pogson, extracted from a letter read before the Agri«-Hort. Soc. of India, may be quoted, as they show that the oil at one time received a certain amount of attention in India. He writes:--- "I would strongly recommend European landed proprietors to cultivate the common cress, or halim of India, for the sake of its oil. One hundred pounds of the seed on being pressed will yield no less than 57<sup>1</sup> of oil, whilst that of the sunflower gives but 15ft. [Journal (New Series), V,f. *Pro.*, xx%. No writer appears to have recorded the useful properties of cress-oil, but if the amount obtainable is even approximately that mentioned by Lieutenant Pogson, it w«ld appear to be worthy of greater attention than it has up to this time received.

Medicine.—The SEEDS are described by later writers on Sanskrit mędicine as tonic, alterative, useful in hiccup, diarrhoea, and skin diseases arising from disordered blood (U. C. Dutt). By Muhammadan writers the cress is identified with the Kaplapov of the Greeks, and the seeds are considered hot and dry in the third degree, aphrodisiac, and diuretic. They are recommended for the dispersion of certain chronic enlargements of the S?Jf2?V&c.' iVi as an alterative in various conditions supposed to be pro-?£ 2 w i<sup>y Cold humou TS</sup> (Dymock). Ainslie states that the 'Arabians place habit of \*<sup>TMon</sup>C''<sup>hei</sup>.' noterchat (vesicatoria); that the hakims are in the nabit of prescribing it as a stomachic and gentle stimulant. He remarks, L. 286

CULTIVA-TION. 284

> OIL. Seed. 285

MEDICINE. Seeds. 286

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| Medicinal properties of the Cress. (J. Murrav)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <sup>LEP</sup> IDIUM<br>sativum.        |
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| however, that the latter doubt whether it does not sometimes, if imprudently given, bring about abortion. The <i>Vytians</i> esteem it, when bTsed "n3 mixed with lime-juice, as a valuable repellent in cases of local inflammation O'Shaughnessy quotes these remarks, and adds that he foundTeoW answer as a gentle and warm aperient.<br>By mcxiem practitioners of Indian medicine the seeds are considered usefulin dysentery and dysentencdiarrhoea, and also in febrile and catarr hal affections. Moodeen Sheriff, m his <i>Mat. Med. of Madras</i> , writes Externally it is of great service in all the diseases in which the mustard is resorted *to. The thick and very gummy mucilage of the seeds acts as a mechanical antidote m cases of poisoning by irritant substances, enveloping the poisonous particles and sheathing the mucous membrane of the stomach an* intestine. The same writer regards the seed as a more satisfactory rubefacient than those of mustard-seed prepared in India, and asserts that, in his opinion, if as carefully and finely ground as English mustard-flour, it would probably be superior to that also. He also states that the mucilage obtainable from the seeds may be used as a substitute for imported tragicanth and gum-arabic.                                                                                                                                                                                   | MEDICINE.                               |
| early part of this century, that the PLANT itself was administered incases<br>of asthma, cough with expectoration, and bleeding piles, and that the ROOT<br>was used in secondary syphilis and tenesmus. According to Be I lew the<br>seeds are also considered to be lactagogue in the Panjib, and are adminis-<br>tered, after being boiled with milk, to cause abortion.<br><i>Doses.</i> —" Of the seeds, from one to two and a half drachms; and of<br>the decoction from one to three fluid ounces; three or four times in the<br>twenty-four hours." <i>(Moodeen Sheriff.)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Plant.<br>287<br>Root.<br>288           |
| CHEMICAL COMPOSITION.—"The herb and seeds distilled with steam yield a volatile aromatic oil which does not separate spontaneously from the watery distillate, but may be extracted therefrom by agitation with benzene. Three-fourths of the crude product boiled at 226-5° exhibited the composition of pure a toluonitril phenyl-acetonitril, or phenyl-methyl cyanide, $C_6H_5CH_3CN$ , and when heated to $207^0$ for a short time with hydrochloric acid, yielded phenyl-acetic acid'' ( <i>Watts, Dictionary of Chemistry, VIII., ft I., quoting from A. W. Hofmann</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Chemistry.<br>289                       |
| SPECIAL OPINIONS.—§" The decoction of the seeds is thus prepared:<br>Take of the seeds, bruised, six drachms; liquorice root, cut into small pieces<br>and bruised, one drachm; water, one pint and a quarter ; boil for 10 minutes<br>in a covered vessel, and strain when cool. The dose of the seeds is from<br>one to two drachms and a half; and of the decoction, from one to three fluid<br>ounces; three or four times in the twenty-four hours. The best medicinal<br>property of this drug, according to my own experience, is its usefulness in<br>dysentery and dysenteric diarrhoea. The coarse powder and the thick and<br>very gummy mucilage of the seeds appear well-suited to allay the irritation<br>of the mucous coat of the intestings in those diseases, and they thus relieve<br>or check their symptoms to a considerable extent. The coarse powder or<br>mucilage of course is not always sufficient to complete a cure by itself, but,<br>like many other remedies in dysentery, requires the assistance of some<br>other medicines according to the circumstances of each individual case.<br>The entire seeds swallowed with water have also some control over the<br>above-named diseases, in consequence of their property of becoming soft<br>and mucilaginous when moistened, but are much less efficacious in this<br>respect than their powder or mucilage" <i>[Honorary Surgeon Moodeen</i><br>Sheriff Khan B*hadur. Trinlicane Madras) | ,<br>FOOD&<br>FODDER.<br>Leaves.<br>290 |

| LEPTOCH<br>chinen                   |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|                                     | By Europeans, cress is chiefly consumed as a salad, and is also used for garnishing dishes. Stocks states that in Sind it is employed as a fodder                                                                                                                                                                                                                                                                                      |
| trade.<br><b>291</b>                | For horses, camels, oxen, &c.<br><b>Trade.</b> —The seeds are largely imported from Persia into Bombay and<br>are to be found in all bazars. Oymock states that their value is R3-4 ?? <sup>T</sup><br>maund of 37Jib. Moodeen Sheriff writes that the wholesale price is B3<br>per maund; retail, annas 3 per pound.                                                                                                                  |
|                                     | LEPTADENIA, Br.; Gen. PL, II, 778.                                                                                                                                                                                                                                                                                                                                                                                                     |
| 292                                 | [Ic.,t. 3SOf AstfLEPIA <sup>DE.E.</sup><br>Leptadenia reticulata, Wight & Am.; FL Br. Ind., IV., 63; Wight<br>Syn.—L. APPENDICULATA, Dene.; L. IMBERBE, Wight; L. BR£V' <sup>AS</sup> f<br>Wight; CYNANCHUM RETICULATUM, Retz.; C. ASTHMATICUM, *****<br>(?)C. OVATUM, Tkunb.s SECAMONE CANESCENS, Sm.s ASCLEPIAS SU»»<br>ROSA, Roxb.1 GVMNBMA AURANTIACA, Wall.<br>Vern.—Rayadodi, shinguti, dodhi, pala-kuda, BOMB.; Paldkidi, TAM.; |
|                                     | Pdla tige, kalasa, TEL.<br>,,<br>References—Roxb., FL Ind. % Ed. C.B.C., 2541 Dalz. & Gibs., Bomb+*t>*<br>152; Elliot, Flora Andhrica, 143; Lisbon, U. PI. Bomb., 165, 201; Uaee*'<br>teers—Mysore and Coorg, /., 62; NW. P., IV., Ixxiv.                                                                                                                                                                                              |
|                                     | Habitat.—A twining shrub with corky bark, found in the Eastern Pan-<br>jib, from Banda southwards through the Deccan Peninsula, also in Burma,                                                                                                                                                                                                                                                                                         |
| POOD.<br>Leaves.                    | Singapore, and Ceylon.<br>Food.—The LEAVES and tender SHOOTS are used in some parts of India<br>as a vegetable, especially during times of scarcity, and the FOLLICLES, known<br>as shinguti or dodhi, are also sometimes employed in the same way<br>(Lisbon)*                                                                                                                                                                        |
| Shoots.<br>2Q4<br>Follicles.<br>296 | Lisoon)<br>L. Spartium, Wight* FL Br. Ind,, IV., 64.<br>Syn.—LEPTADENIA PYROTECHNICA. Dene.; L. JACQUEMONTIA and<br>us, Dene.; CYNANCHUM PYROTECHNICUM, Forsk.; SARCOSTEMMA E.<br>ROTECHNICA, Br.; MICROLOMA PYROTECHNICA, Sprettg.; M. ANGUST                                                                                                                                                                                         |
|                                     | FOLIA, Ham.<br>VertL—Kip, SIND.<br>References.—Royle,Fib. Plants,306; Stocks, Rep. on Sind; Gaaetteers.—<br>Bomb., V.,27; Sind, 559; NW. P., IV., Ixxiv.<br>Habitat.—A glabrous shrub of the Panjab and Sind, extending east                                                                                                                                                                                                           |
| FIBRE.<br>297                       | wards to the Jumna, and distributed to Baluchistan, Arabia, Egypt, and<br>Senegambia.<br>Fibre.—Dr. Stocks states that the fibre of this species is "much used m<br>Sind for making ropes to bring up water from wells, as water does not rot<br>it." Dr. Bards and a synthesize of the same absorber that it is for                                                                                                                   |
| FODDER.<br>298                      | <ul> <li>it." Dr. Royle adds on the authority of the same observer that it is frequently combined for this purpose with the fibre of Periploca aphylla, <i>Dene</i>. Fodder.—In the <i>Sind Gazetteer</i> this plant is described as " one of the most important fodder plants in the province for horses, cattle, and camels. Mr. J. H. Lace informs the writer that it is largely used as a camel fodder</li> </ul>                  |
| domestic.<br>299                    | <ul> <li>in Sibi.</li> <li>Domestic.—The plant is said by Mr. Lace to be extensively employed in Sibi for thatching purposes.</li> <li>L, viminea, Bth.9 see Orthanthera viminea, W. &amp; A.; Vol. V.</li> </ul>                                                                                                                                                                                                                      |
|                                     | LEPTOCHLOA, Beauv.; Gen. PL, III., 1172.                                                                                                                                                                                                                                                                                                                                                                                               |
| 300                                 | Leptochloa chinensis, Nees./ Duthie, Fodder Grasses of Northern                                                                                                                                                                                                                                                                                                                                                                        |
|                                     | [India, 59, PL Ixxi. / GRAMINE*.<br><sup>Syn</sup> , <sup>w</sup> <sup>L</sup> * TENERRIMA, R. & S. ; POA CHINENSIS, Kan.; P. DECIPTENS<br>R. Br. s ERAGRQSTIS DECIPIENS, Steud.                                                                                                                                                                                                                                                       |

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| A Useful Fodder plant. (J. Murray.) L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ESPEDEZA |
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| Vein.—Chdnkel, chipa-chi-magadi <sub>t</sub> jkira, pkulhia <sub>%</sub> NW. P.<br>References.—Symonds, Grasses of the Ind. Penin. <sub>9</sub> 29; Gag., NW. P<br>IV., Ixxx.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |
| Habitat.—A common grass on the sides of water-courses, and in moist places, throughout the plains of India.<br>Fodder.—See Fodder, Vol. III., 423.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |
| ^LEPTORHABDOS, Schrenk.; Gen. PL, II., 97/.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |
| f SCROPHULARINEJB.<br>Leptofjiabdos Benthamiana, Walp.; FL Br. Ind., IV., 303;<br>Syn.—GERABDIA PARVIFLORA, Wall.; LEPTORHABDOS VIRGATA, Benth.;<br>L. PARVIFLORA, Be nth.; DARGERIA PINNATIFJDA, Dene.<br>% Vern.—^Stri lasht, BALUCH,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3oz      |
| Habitat.—An erect slender herb, found in the Western Temperate<br>Himalaya, from Kashmir to Kumaon, at altitudes from 5,000 to 11,000<br>feet, also in Western Tibet; distributed westwards to Afghanistan, Balii-<br>chistdn, and Persia.<br>Fodder.—Mr. J. H. Lace informs the writer that this plant is one of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FODDER.  |
| the principal summer fodders for sheep and goats throughout the Juniper<br>Forests of Baluchistan. re r                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 302      |
| LepilSj see Hares, p. 202.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
| LESPEDEZA, Mich.; Gen. Pl., /., 524.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 303      |
| A genus of herbs or undershrubs belonging to the Natural Order LE-<br>GUMINOS <sup>^</sup> , which comprises some twenty to twenty-five species, of which nine<br>or ten are natives of India. None of the Indian species appear <i>to</i> be of eco-<br>nomic value, but it is possible that some, if not all, might be utilised as fodder.<br>L. stricta, the "Japan Clover," a Chinese or Japanese plant, has of late<br>years attracted much attention, in America, as a fodder plant. It is not<br>known how the plant was originally introduced into that country, but it is<br>supposed that it spread from a few seeds obtained from a cargo <sup>^</sup> of Japan<br>tea, and started gowth near Charleston about 50 years ago. The plant<br>has spread over large tracts and appears to possess many very valuable<br>properties. The <i>Indian Agriculturist</i> of January 1st, 1887, contains<br>the following:—" The plant is an annual but comes up year after >ear,<br>self-sown, and grows so vigorously, that it smothers many other grasses<br>with which it comes in contact. One writer is of opinion that it will<br>never be of real value as a crop to be cultivated like clover, and a New<br>York agricultural paper states that, although on rich, damp, soil, it will<br>grow as high as 18 inches, the leaves are small, and the stems too hard<br>and woody to make good hay. On the other hand, a Virginia farmer gives<br>his experience as entirely favourable to the plant. Ten years ago he pro-<br>cured some seed and sowed it on an acre in the middle of a 60-acre field,<br>being informed that it would spread all over the field and afford excellent<br>grazing. This turned out to be true, Japan clover and Bermuda grass<br>being the only fodders that kept green during the drought of 1885. Japan<br>clover, he adds, starts early and by July or August, when other fodders<br>are failing, it forms a heavy dense sod, and afford excellent grazing till<br>killed by sharp frost, but it starts again in the following' spring, and spreads<br>year by year. It will grow and form a sod on the thinnest land, and even<br>in roads and other bare places where nothing else will grow. In |          |

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| LEUCAS<br>aspera.      | Lettsomia; Lettuce; Leucsna*                                                                                                                                                                                                                                                                                                                                                                                               |
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|                        | latter consisting of lime, magnesia, potash, soda, phospheric and sulphuric acids. <sup>1&gt;f</sup>                                                                                                                                                                                                                                                                                                                       |
|                        | From these accounts it would appear that the plant is remarkably hardy, and has great powers of resistance to drought,—qualities which ought to render it an extremely useful fodder plant for India.                                                                                                                                                                                                                      |
|                        | LETTSOMIA, Roxb.; Gen. PL, IL, 8 <sup>^</sup> .                                                                                                                                                                                                                                                                                                                                                                            |
| 304                    | LettSOmia elliptica, Wight; Ft. Br. Ind., IV., 192; CONVOLVTILACEJE.<br>Syn.—CONVOLVULUS ELLIPTICUS, Spreng.; C. LAURIFOLIUS, Roxb.;<br>IPOMIEA ELLIPTICA, Rolh.; I. LAUKIFOLIA, Sweet; ARGYR'UA KLLIP'<br>TIC A, Chois.                                                                                                                                                                                                   |
|                        | Vem.— Vonangadi, KAN.<br>ReferencesRoxb., Fl. Ind., Ed. C.B.C., 15*; Dais. & Gibs., Bpmb.<br>FL, 169.                                                                                                                                                                                                                                                                                                                      |
| INDUSTRIAL.<br>Leaves. | Habitat.—A scandent shrub of the Deccan Peninsula and Ceylon.<br>Industrial Use.—The fresh LEAVES are employed in the manufacture or<br>steel in Mysore. (See Iron, p. 503.)                                                                                                                                                                                                                                               |
| 305                    | Lettucej see Lactuca Scariola, Linn., var, sativa ; p. 578.                                                                                                                                                                                                                                                                                                                                                                |
|                        | LEUCIENA, Benth.; Gen. PL, /., \$94-                                                                                                                                                                                                                                                                                                                                                                                       |
| 306                    | Leucana glauca, Benth.; II. Br. Ind., II., 290; LEGUMINOSJE.                                                                                                                                                                                                                                                                                                                                                               |
|                        | Syn.—ACACIA FRONDOSA, <i>Willd.i</i> A. CARINGA, <i>Ham.;</i> A. GLAUCA,<br>BICEPS, and LEUCOCEPHALA, <i>DC</i> .                                                                                                                                                                                                                                                                                                          |
|                        | Vern.—Tagarai-virai, TAM.<br>References.—Brandis, For. Fl., 172; Gamble, Man. ofTimb., 14S: Bidie,<br>Cat. Raw. Prod., S. India, 120.                                                                                                                                                                                                                                                                                      |
|                        | Habitat.—A shrub or small tree, met with throughout India, and other                                                                                                                                                                                                                                                                                                                                                       |
|                        | parts of Tropical Asia and Africa, but probably indigenous only to Tropical America.                                                                                                                                                                                                                                                                                                                                       |
| TIMBER.<br>307         | <b>Structure of the Wood.</b> —White, hard.<br><b>Domestic—Dr. Bidie</b> states that the SEEDS <b>are employed in Madras for</b>                                                                                                                                                                                                                                                                                           |
| DOMESTIC.<br>Seeds.    | making fancy bags, baskets, and ornaments.                                                                                                                                                                                                                                                                                                                                                                                 |
| 308                    | <b>LEUCAS,</b> Br.; Gen. PL, II., 1213.<br>A genus of woolly or villous, rarely glabrate, herbs or undershrubs, which<br>belongs to * he Natural Order LABIATVE and comprises some 50 species, natives<br>of Asia and Africa. Of these 38 are indigenous to India.                                                                                                                                                         |
| 309                    | <b>Leucas aspera,</b> Spreng. ; FL Br. Ind. <sub>%</sub> IV., 690 ; LABIATE.                                                                                                                                                                                                                                                                                                                                               |
|                        | Syn.—L. PLUKENETII, Benth.; L. DIMIDIATA, Benth.; PHLOMIS ASPERA*<br>Willd.i P. PLUKENETII, Roth.; P. ESCULENTA, Roxb.; P. OBLIQUA*<br>Ham*                                                                                                                                                                                                                                                                                |
|                        | Vern.—Chota-hal-klusa, HIND., BENG.; Thurduribaji, DEC; Tatnba,<br>BOMB.; Tumbai-chedi, thombay-keeray, TAM.; Tumma-chettu, tutnmi%<br>kura, TEL.                                                                                                                                                                                                                                                                          |
|                        | References.—Roxb., Fl. Ind., Ed. C.B.C., 461; Data. & Gibs., Bomb. Fly<br>211; Grah., Cat. Bomb. Pl.,iS3; Pharm. Ind., 169; Dymock, Mat. Med.<br>W. Ind., 2nd Ed.,889; Bidie, Cat. Raw Pr., Paris Exh., 38; Lisboa, U'<br>PI Bom., 203; AgriHort. Soc. of Ind. /—Journals (Old Series) IV.,<br>IS; X., 23; Gaaetteers:—N. W. P., I., 83; IV, Ixxvi; Ind.,Forester,<br>II, 25; III., 237; District Manual, Coimbatore, 247. |
| i                      | Habitat.—A small very variable herb of the plains of India, extending<br>from Sikkim and Behar westwards to the Pan jab, and southward to Cape                                                                                                                                                                                                                                                                             |
| MEDICINE.              | Comorin ; distributed to Mauritius, Java, and the Philippine Islands.                                                                                                                                                                                                                                                                                                                                                      |
| Juice.                 | Medicine.—Reputed, apparently without reason, to be an antidote for.<br>snake-bite. The JUICE of tr.e leaves, according to Dr. J. Shortt, is an                                                                                                                                                                                                                                                                            |
| 310                    | application of some value in cases of psoriasis and other chronic skin diseases.                                                                                                                                                                                                                                                                                                                                           |
|                        | L. 310                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Products of India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 633                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Famine Foods. (J. Murray.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LEUCAS<br>linifolia,                                                                                                                                                                                                                                               |
| SPECIAL OPINIONS.—§ "The leaves are said to be useful in chronic<br>rheumatism" ( <i>Civil Surgeon</i> C. J. W. Meadows, Burrisal). "In North<br>Bengal the flowers of Leucas aspera, L. Cephalotes, and L. linifolia are<br>given warmed in a little honey for coughs and colds to children. The juice<br>of the leaves is applied to disperse painful swellings, and answers the same<br>purpose as tincture of iodine. Also given in skin diseases " (C. T. Peters,<br>M.B., Zandra, South Afghanistán).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MEDICINE                                                                                                                                                                                                                                                           |
| Pood.—The LEAVES and TENDER SHOOTS are used as a pot-herb even<br>in ordinary seasons, and were largely utilised in the Deccan Famine of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | FOOD.<br>Leaves ft<br>Shoots. •<br><b>311</b>                                                                                                                                                                                                                      |
| <ul> <li>Leucas Cephalotes, Spreng.; Fl. Br. Ind., IV., 689; Wight, Ic., Syn_LEUCAS CAPITATA, Desf.; PHIOMIS CEPHALOTES, Roth.</li> <li>* Vern. Dhurpi sag, HIND.; Bara halkasd, BENG.; Andia dhurup arak, SANTAI-15 Phuman, sisafius, maldoda, guldoda, chatra, PB.; Kubi, Guz.; Tumba, MAR.; Pedda tumni, tumni, TEL.; Keddri, KHANDESH.</li> <li>References.—Roxb., FL Ind., Ed. C.B.C., 461; Grah., Cat., Bomb. PL, 153; Dal<sup>0</sup>* &amp; Gibs., Bomb. FL, 211; Stewart, Pb. PL, 168; Elliot, Flora Andhrica, 150, 184; Campbell, Ec. Prod. Chutia Nagpur, No. 9106; Dymock, Mat. Med. W. Ind., 2nd Ed., 617, 888; S. Arjun, Bomb. Drusrs, joi • Cat. Baroda Durbar, Col. Ind. Exhib., No. 124; Atkinson, Him. DisL 316; AgriHort. Soc. of Ind. :—Jour. (Old Series), X., 23; Gagetteers:—NW. P., IV., Ixxvi; Bombay, V., 28; Ind. Forester, XII.,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 312                                                                                                                                                                                                                                                                |
| APp., 19.<br>Habitat.—A common herb on the Himalaya at altitudes of 2,000 to<br>6 000 feet, from Simla to Bhután; found also in the plains from Chittagong<br>and Assam westwards to the Panjib, and southwards through the Deccan;<br>distributed to Afghanistán.<br>Oil.—The SEEds yield an oil, which is used medicinally in Chutia<br>Nagpúr ( <i>Campbell</i> ) and by the Manipuris as an adjunct in dyeing with<br>Rribia ( <i>Watt</i> ). SeeRabiasikkimensis,Ar«r£r.<br>MedicineThe PLANT is considered a mild stimulant and diaphoretic<br>and is considerably used in fevers and coughs. The OIL, as above stated,<br>is also said to be employed medicinally by the Santals, but Mr.<br>Campbell does not mention its therapeutic action. The fresh JUICE IS<br>used in certain localities as an external application in scabies. The FLOWERS<br>are administered in the form of a syrup as a domestic remedy for coughs<br>and colds.<br>Food.—The LEAVES are eaten as a pot-herb, in some parts ottne<br>country, and were largely used as an article of food in the Khandesh Dis-<br>trict during the famine of 1877-78-<br>Domestic and Sacred.—Stewart states that the LEAVES are stirred<br>UD with milk in the Panjab for the sake of the odour they impart. The<br>FLOWERS are sacred to Siva, and are frequently used as an offering.<br>L. Clarkei, Hook./.; FL Br. Ind., IV., 688.<br>Vem.—Enga dhurup, 'arak, SANTALI; Dhurpi sag, HINDI, CHUTIA NAG- | OIL.<br>Seeds.<br><b>313</b><br>MEDICINE.<br>Plant.<br><b>314</b><br>Oil.<br><b>315</b><br>Juice.<br><b>315</b><br>Juice.<br><b>315</b><br>Flowers.<br>FOOD.<br>Leaves.<br><b>318</b><br>DOMESTIC ft<br>SACRED.<br>Leaves.<br><b>319</b><br>Flowers.<br><b>320</b> |
| PUR.<br><i>Reference.—Campbell, Ec. Prod., Chutia Nagpur, No. pros.</i><br>Habitat.—A common weed of cultivation in Chutia Nagpur and benar.<br>Food.—" The LEAVES are eaten as a pot-herb * ( <i>Campbell</i> ),                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>321</b><br>FOOD.<br>Leaves.                                                                                                                                                                                                                                     |
| L. linifolia, Spreng.; Fl. Br. Ind., IV, 690.<br>Syn.—LEUCAS LKVAHDVLJEFOLIA, Sm.; PHLOMIS LINIFOLIA, Roth.;<br>P. ZEYLANICA, Roxb.; LEONURUS INDICUS, Burm./ var. decipiens,<br>Sm.; L. ASPERA, PL Ind. Or. Hohenack.<br>Vern.—Gumd, hal-khusa, HIND.; Halkasd, BENG.; Dron, ASSAM; Gumi,<br>kumbha, GOND; Goma, DEC; Pula tummig TEL.; Dronapushpi, SANS.<br>L. 323                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 322<br>323                                                                                                                                                                                                                                                         |

| LEUCAS<br>zeylanica.       Famine Foods.         References.       —Roxh., FL Ind., Ed. C.B.C., 461; Grah., Cat. Bomb.<br>153; Dais. & Gibs., Bomb. Fl., 2ih; Elliot, Flora Andhr., /\$*/<br>Dutt, Mat. Med. Hind., 297; Dymock, Mat. Med. W. Ind., 2nd<br>617; Drury, U. PL, 277; A Note on the Condition of the People of A.<br>18f>8; Agri. Hort. Soc. of Ind.:—Jour. {Old Series}, X., 23; Gazet<br>Bombay, VI., 15.         Habitat       A start borb met with in the plains from Assam Box                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| Dutt, Mat. Med. Hind., 297; Dymock, Mat. Med. W. Ind., 2nd<br>617; Drury, U. PL, 277; A Note on the Condition of the People of A.<br>18f>8; Agri. Hort. Soc. of Ind.:—Jour. {Old Series), X., 23; Gazet<br>Bombay, VI., 15.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| United A start hard mat with in the plains from Assem Ba                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Habitat.—A stout herb met with in the plains, from Assam, Ber<br>and Sylhet to Singapore, also in the Deccan, and on the West Coast<br>the Konkan to Travancore.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| MEDICINE.<br>Leaves. MedkineMr. J. F. Duthie informs the writer that the natives of tral India believe that the LEAVES, when roasted and eaten with Salt,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>324</b> febrifugal properties. Mr. Long writes, in his account of the indigen<br>plants of Bengal, "The Ceylonese attribute almost miraculous curr<br>powers to this plant. The leaves are bruised and a tea-spoonful of<br>given, which is snuffed up the nostrils, and used by natives in the No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| West, as a remedy against snake-bite; the mungoose also eats it. The f<br>juice is employed as a remedy against headaches and colds." In the<br>going statement it is difficult to understand how much applies with<br>sation of the plant in Cevlon, how much appertains to Bengal. — a Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| is said not to occur in Ceylon. It appears possible that certain of properties attributed to this species in the above description should prof                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| the fact that <b>Phlomis zeylanica</b> , <i>Roxb.</i> , is identical with this species<br>linifolia, <i>Spreng.</i> ), while <b>Phlomis zeylanica</b> , <i>Linn.</i> , is the true Ceylon P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| L. zeylanica, Br.<br>It may be mentioned, however, that in the Gujarat Gazetteer the s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| FOOD.<br>Tops.<br>325<br>DOMESTIC<br>& SACRED.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flowers.<br>Flower |
| 326 Leucas mollissima, Wall. / Fl. Br. Ind., IV., 682.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 327 Syn.—LEUCAS PILOSA, VAR. PUBESCENS, Benth.<br>Van—scaberula, Clarke.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| ,, angustifolia, Z. ANGUSTIFOLIA, Wall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ,, strigosa, Z STRIGOSA, <i>Benth</i> .<br>Vern.— <i>Gitil arak</i> , SANTALI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| References. — Campbell, Ec. Prod. Chutia Nagbur, Nos. 9406 & 9<br>Stewart, Jour, of a Bot. tour in Hazara, &c., xn Jour. AgriHort.<br>Ind. (Old Series), XIV., 27, 42; Gazetteers, NW. P., /., *3t<br>Ixxvi; X., 315.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ul> <li>FOOD.</li> <li>Leaves.</li> <li>328</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>329</b> L. zeylanica, $Br_{i}$ , Fl. Br. Ind., IV., 68 g; Wight, 111, /. 176.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Sy <b>A</b> _LEUCAS INVOLUCRATA, Benth.; PHLOMIS ZEYLANICA, Linn.;<br>OMURUS MARRUBIASTRUM, Burnt.<br>Vern.—Gatta-t&mba, SING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Reference.</b> — <i>Thwaites, En. Cal. Pb.</i> , 240.<br><b>Habitat.</b> — <b>A herb of Assam, Kachar, and Chittagong, the Malay Pe</b><br><b>sula, and Ceylon.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| L. 329                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Lichens.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | (J. Murray.)                                                                                                                                                                                                                                                                           | LICHENS.                                        |
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| Medicine.—Thwaites states that the natives of Ceylon<br>as a medicine. It is possible that the information give<br>quoted by Drury under L. linifolia may refer to this speci-<br>Food.—The Singalese are said to employ the LEAV<br>in their curries.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | en by Long and es.                                                                                                                                                                                                                                                                     | MEDICINE.<br>Leaves.<br>330<br>FOOD.<br>Leaves. |
| LICHENS, Bailie Traitt de Botanique Medicate Cry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ptogamique, 56.                                                                                                                                                                                                                                                                        | 331<br>332                                      |
| L i c h e n s may be defined as cellular perennial cryptoga<br>nished with a vegetative system containing gonidia, and a<br>tem consisting of female apothecia and male spermogonia.<br>have adopted a theory, originally promulgated by Schwen<br>to which Lichens are compound structures, composed (<br>•hyphae) and certain elementary algae (the gonidial elemen<br>which produces the reproductive bodies and is nourished b<br>the purposes of this article it is convenient, however, to                                                                                                                                                                                                                                                                                                                                                                                                       | reproductive sys-<br>Many botanists<br>dener, according<br>of a fungus (the<br>its), the former of<br>y the latter. For<br>follow the older                                                                                                                                            | 002                                             |
| system, and to retain the classification and terminology of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ·                                                                                                                                                                                                                                                                                      | _                                               |
| <ul> <li>Vem~-Chharild, pathar-ka~phtil, used assidye=chulch chalira, char char Ha, dusneh, hiunsew, PB.; Mot a d ddgadabhul, BOMB.; Kulpasi, TAM.; Rdtipdchi, rat aj'a, saileya, SANS.; Ushir ah, ARAB.; Dowdlah, Pei s.</li> <li><b>References.</b>—Acharius, Lichenologie; Lindsay, British I Lin. Soc.; Stewart, Pb. PL, 269; Elliot, Fl. Andhr. the Lichenology of India, 1879; Encyclop. Britanrtica, Ind., 258; Ainslie, Mat. Ind., 11, 170; O'Shaughness: 671 / U. C. Dutt, Mat. Med. Hind., 3i5; Dymock, M 2nd Ed., 864 f Flack. &amp; Hanb., Pharmacog., 737 Med. PL, 30i, 302; Honigberger, Thirty-five years 299; Boyle, Prod. Res., 232; Watts, Die. Chem., V Smith, Die, 144, 244; Ure, Die. Indus.* Arts, and Agru-Hort. Soc. of Ind.:-Transactions, V.,87,94, pro pro., 123, journals (Old Series), II., 208, sel., 307, pro 300; X., 363; Indian Forester, XIV., 209, 318.</li> </ul> | Idgada phúl, batik<br>hapu, TBL.; Sail-<br>Lichens; Crombie,<br>, i63; Stirton, on<br>, XIV., 552 ; Pharm<br>y, Beng. Dispens.,<br>Iat. Med W. Ind.,<br>; Bent. & Trim.,<br>in the East, II.,<br>'III., Pt. II., 1753;<br>Manu., HI., 3i3;<br>o., 87, 100; VII.,<br>o., 402; IX., 297- |                                                 |
| Habitat and Distribution.—Lichens are chiefly found of<br>trees, rocks, the ground, mosses, and more rarely perennial<br>be regretted that the distribution in India of the numerous sp<br>of economic interest is not accurately known. With the e<br>collection made by Sir J. D. Hooker on the Himálaya,<br>observers in the same region, on the Nilghiris, and in the m<br>a few of the larger towns in the plains (such as those made<br>by Dr. Watt), little or nothing has been done towards the<br>knowledge of Indian lichenology.                                                                                                                                                                                                                                                                                                                                                            | leaves. It is to<br>becies of Lichens<br>exception of the<br>and by a few<br>eighbourhood of<br>e near Calcutta                                                                                                                                                                        | DISTRIBU-<br>TION.<br><b>333</b>                |
| A consideration, however, of the very varying climatic<br>conditions and the great range of altitude to be found in Inc<br>conclusion that the numbers of species must be very great, a<br>ability most of the forms which possess economic interest<br>many parts of India. In the following article, therefore, the<br>not be confined to forms known to be Indian, but others of<br>est will also be referred to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | dia, leads to the<br>and in all prob-<br>are met with in<br>description will                                                                                                                                                                                                           |                                                 |
| Chemical Composition.—Before entering into a consider<br>economic uses of Lichens, it may be advisable first of all<br><i>risttmi</i> of the known facts regarding their chemical com-<br>principal substance occurring in lichens, especially in such a<br>and fruiticulose is <i>lichenine</i> —a special kind of carbohydr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | to give a brief<br>position. The<br>s are foliaceous                                                                                                                                                                                                                                   | CHEMISTRY.<br>334                               |

and fruiticulose, is *lichenine*—*a*. special kind of carbohydrate peculiar to these plants. This substance is intermed iate in character between dextrin and starch, having the formula  $C_6H_{10}O_6$ . It is obtained as a jelly-like deposit . from an aqueous- extract of many lichens, and perhaps exists in greatest abundance in Cctxaria islaadica. By boiling with sulphuric or hydrochloric

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| LICHENS.          | Economic Properties of Lichens                                                                                                                               |
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|                   |                                                                                                                                                              |
| CHEMISTRY.        |                                                                                                                                                              |
| -                 | _^''^j^Iar^ainsscat^e^^o^^j^tiss^^ISjo^^ivil exists in small                                                                                                 |
|                   | phospnate of time, sea sait, mangamese, iron ; (a) picrolichenine, variotatine,                                                                              |
|                   | orceine, cetrarine, ingline, crythrine, rocceline, piero-erythrine (2) pyrophone                                                                             |
|                   | acid, parellic acid, usneic acid, orceic acid, crythrinic acid; (4) sugar (not                                                                               |
|                   | crystallisable), oil, waxy matter and resingus matter. The ash of lichens is said to constitute from 8 to to per cent. of the whole, and consists of stricus |
|                   | alkalies, alkaline earths and metals, such as potash, soda, lime, magnesia,                                                                                  |
|                   | tog/wai/tlieas=/a////ai- und in in combination with certain acids.                                                                                           |
|                   | the principal of which are carbonic, phosphoric, sulphuric, and hydrochloric.                                                                                |
|                   | The chemical re-actions effected by several re-agents such as loding,<br>ammonia, &c., on the thailus of lichens are of great interest, and of care          |
|                   | siderable importance in determining the systematic position of species, but                                                                                  |
|                   | are not of sufficient economic importance to require description in this work.                                                                               |
| GUN.              | Gum.—At one time several species were employed in the arts for the                                                                                           |
| 335               | manufacture of a gum as a substitute for gum-arabic. The author of the article "Lichens" in the Encyclopadia Britannica states that the chiel of             |
|                   | these were Ramalina frazinea. Evernia nonmatri, and Parmalin whysofer.                                                                                       |
|                   | all of which contain a considerable propertion of promove marrer and were                                                                                    |
|                   | employed in calico-printing, and for making parchment and card boate                                                                                         |
|                   |                                                                                                                                                              |
|                   | India, though oraaastn-does not appear to have been recorded.                                                                                                |
| DYE.              | Dysite most important utilisation of lichens in the acts is in the Pro-                                                                                      |
| Litmus,           | paration of various dyes, the principal of which are knowning commerce as                                                                                    |
| 330<br>Orehit,    | LITMUS, ORCHIL, OR ARCHIL, and A A A A A A A A A A A A A A A A A A A                                                                                         |
| - 337<br>Cudbear. | value of this lichen varies greatly according to the locality from which it is                                                                               |
| - Cudbear,        | obtained, the best being derived from the Canaries and Cape de Verde. A                                                                                      |
| 338               | certain amount is obtained from Ceylon, where it grows on the stems of                                                                                       |
|                   | certain palms; and in 1886 was said to fetch from £10 to £50 a ton.<br>Samples of the true orchil, R. tinctoria, were also sent to the Colonial and          |
|                   | Indian Exhibition, as a drug, from Madras, where, however, no knowledge                                                                                      |
|                   | appears to exist of its value as a dye : nor does any account of the amount                                                                                  |
|                   | obtainable, and the locality from which derived, appear to exist. Lindsay                                                                                    |
|                   | alludes to R. fuciformis as found on the mango tree at Pondicherry.<br>Orchil differs in appearance according to its mode of preparation, two                |
|                   |                                                                                                                                                              |
|                   | orchil. Both are purplished thick liquids, with an animomacal occur,                                                                                         |
|                   | and are prepared by the action of ammonia on the acids contained in the<br>lichen structure. The ammoniacal liquor may be prepared in the ordinary           |
|                   | way from sal-ammoniac, lime, and water, or may consist of a mixture of                                                                                       |
|                   |                                                                                                                                                              |
|                   | Dive in the fact that heat is used. The addition of potash or soda to the                                                                                    |
|                   | ammoniacal liquor results in the production of a blue colouring matter,                                                                                      |
|                   | and the arrs, as a test for alkalinity or acidity.                                                                                                           |
| Porelle.          | Another dye product of considerable value is PERELLE prepared from                                                                                           |
| 339               | dye. CUDBBAR, a dye stuff of inferior quality to either of the above, is                                                                                     |
|                   | utived from Lecanora tertares and was formerly extensively employed by                                                                                       |
|                   | - the peasantry of Northern Buttone for giving a rearlet or overla colour to                                                                                 |
|                   | but several other members of the genus do occur, though apparently they                                                                                      |
| ا<br>عد           |                                                                                                                                                              |
|                   | L. 339                                                                                                                                                       |
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| Amongst other lichens which afford dyes may he mentioned Parmelia<br>saxatilis, P. omphalodes, P. Acetabulum, P. centrifuga, P. conspersa, P.<br>olivacea, P. physodes, and P. stygia, all of which yield brown dyes. ' Of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DYE.                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| these the first, sixth, and seventh have been recorded from the North-West<br>Himalaya; and another species, P. kamtschadalis, found in the same region,<br>is largely employed in the north of India in calico-printing, with the object<br>of imparting a peculiar perfume, and a very pale rose tinge to the cloth,<br>UmWicaria pustulata, several species of Gyrophora, and Urceofaria scru-<br>posa, have also been employed to yield red or brownish dyes in Europe.<br>Yellow dyes are obtained from Chlorea vulpina, Platysma juniperinum,<br>Parmelia caperata, and P. conspersa, Physcia flavicans, P. parietina,<br>P. lychnea, P. puhrerulenta, and P. candelaria. Certain of these are to<br>i>e found in India, others are represented by different species of the same                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DIE.                  |
| genus.<br>Of the numerous dye-yielding lichens above mentioned the true ' Or-<br>chils " are alone of commercial importance. It therefore appears very de-<br>sirable that the question of the occurrence of Roccella in India should be<br>definitely settled, and that the amount obtainable and the localities where it<br>exists should, as far as possible, be accurately determined.<br>Medicine.—Several species of the genera Cladonia, Usnea, Ramalina,<br>Evernia, Cetraria, Sticta, Parmelia, Physcia, Peltigera, Partusaria, and<br>Peltidea were at one time extensively used as medicine in Europe, most<br>of which enjoyed a great reputation as demulcents, febrifuges, astringents,<br>tonics, purgatives, and anthelmintics. Peltigera canina was long regarded<br>as a specific for hydrophobia; Platysma juniperinum was supposed to be a<br>sovereign remedy for jaundice, and other species had attributed to them<br>equally imaginary properties.<br>At the present day only one species is regarded as really of remedial value,<br>namely, Cetraria islandica, or the Iceland moss. This, as above mentioned,<br>contains a very large proportion of lichenine, and is undeniably a valuable<br>demulcent in various dyspeptic and pulmonary complaints. Several species<br>of the same genus occur in India, and it is not unlikely that investigation<br>might prove certain of these to possess equally valuable properties. The<br>only lichens which are described as in general use as medicines in India<br>are Parmelia kamtschadalis, P. perlata, and P. perforata. The first has<br>been well known to Muhammadan writers for many centuries. The author<br>of the <i>Makhzan-el-Adwiya</i> describes it as astringent, resolvent, and aperi- | MEDICINE.<br>340      |
| ent, and states that when burnt the smoke relieves head-ache, and that the<br>powder is a good cephalic snuff.<br>Honigberger describes the same species as officinal at Lahore, and<br>writes, "The <i>Hakims</i> administer it in disorders of the stomach, dyspepsia,<br>vomiting, pain in the liver and womb, induration of the uterus, am enorrhcea,<br>calculi, and nocturnal spermatic discharges." He recommends its adminis-<br>tration in general pain, salivation, soreness of the throat, and toothache.<br>Ainslie mentions Parmelia perlata and P. perforata under the name of<br>Lichen rotundatus. He describes it as "a dry, pale-coloured rock-moss,<br>which the <i>Vytians</i> suppose to possess a peculiar cooling quality and prepare<br>with it a liniment for the head." In the first half of the present century this<br>ichen attracted attention as a diuretic, for which purpose it was first boiled<br>n water, then beaten into a pulp or bruised in a mortar, and placed as a poul-<br>tice over the renal and lumbar regions. Owing to its former reputation it<br>has been referred to in the Pharmacopoeia of India, but Waring remarks that<br>n all probability the continuous application of warmth and moisture by a<br>boultice of linseed or rice would be found equally efficacious.<br>Food and Fodder.—Many lichens form valuable articles of food and<br>odder in the arctic regions and arid steppes of Europe, where food of a bet-                                                                                                                                                                                                                                                                                                 | Food & Fodder.<br>341 |

| LICHENS.         | Economic Properties of Lichens.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| FOOD.            | ter kind is often scarce or altogether wanting. The principal of these are<br>Cetraria islandica (the Iceland moss), Cladina raagiferina, and C. sylva-<br>tica (the Keindeer moss), and several species of Gyrophora which constitute<br>the "Tripe de Roche." This substance when boiled is often eaten by<br>hunger. Another is the " Manna Lichen " (Lecanoraesculenta), which has<br>been described by Pallas as occurring on the steppes of Russia in little glo-<br>bular masses, as large as a walnut. Baillon writes:" It is believed tha these<br>masses, torn from the rocks, can be carried by the wind and deposited so<br>as to form thick beds, which have not unnaturally given rise to tho belief<br>in showers of manna. This must to all appearance be the manna of<br>the Hebrews, of which Parrot saw in several localities in Persia in 1828,<br>beds of over a foot in thickness. These facts agree with what has bee'<br>observed in Algeria, in which country men and animals can, in case of<br>necessity, subsist on this lichen. It is very rich in oxalate of lime, and<br>contains nearly a quarter of its weight of lichenine, along with a certain<br>amount of saccharine material, and a small quantity of a nitrogenous<br>matter."<br>The writer can find only one record of a lichen being employed as food<br>in India. In August 1886, Mr. Brougham, Assistant Conservator of For-<br>ests, Bellary, drew attention to a lichen called in Telegu <i>ratha pu</i> , or " rock<br>flower," which he described as used as a food by the inhabitants of that<br>district, and considered to be a delicacy. It was submitted for identifica-<br>tion to Kew, and was pronounced a species of Parmelia near perforata.<br>This fact was published in the <i>Indian FoPesierior</i> May 1888, with the result<br>that in July of the same year the following further information was communi-<br>cated. " The <i>rathi puvu</i> found in Bellary is probably identical with that<br>found on the large rocks on Horseley konda and Tettu hill in the Cudda-<br>pah District. Its use is unknown in the district, but some merchants from<br>Anantapur export a few bandy-loads annually. They pay |
|                  | May.<br>The business is very profitable, and the seigniorage rate might easily<br>be doubled without causing any hardship to the merchants. Collection by<br>departmental agency is being tried at present, and it is possible that this<br>may induce the Anantapur merchants to make higher bids for the right<br>of collection. The cost of collection and export and the profit obtained<br>are as follows :—                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                  | R       a. p.         Seigniorage on 40 maunds       80 o o         Collection of do.       20 o o         Cartage to Anantapur, 80 miles       80 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                  | Sale of 40 maunds at Rio • • • • $4^{\circ}o o o$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DOMESTIC.<br>342 | Profit • 292 o o"<br>• estic In th prenteenth centur y ??"**********************************                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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| are employed in Sweden as sources of alcohol. They are<br>n sulphuric or hydrochloric acid, by which means glucose is<br>the lichenine, which is then allowed to ferment.<br>Endocarpon Moulinsii is used as a substitute for cork, for lining<br>al collecting boxes, &c, for which its large, tough thallus<br>eculiarly suitable.<br>Tephelium Litchi, <i>Cantb.</i> , Vol. V.; also list of Fruits, Vol. III.,<br>[448.<br>LICUALA, Thunb.; Gen. PL, M.> 928.<br>[ccxxii.<br>eltata, Roxb.; Griffs Palms of Brit. Ind., 120, PI.<br>343 |
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| h sulphuric or hydrochloric acid, by which means glucose is<br>the lichenine, which is then allowed to ferment.<br>Endocarpon Moulinsii is used as a substitute for cork, for lining<br>al collecting boxes, &c, for which its large, tough thallus<br>eculiarly suitable.<br>Tephelium Litchi, <i>Cantb.</i> , Vol. V.; also list of Fruits, Vol. III.,<br>[448.<br>LICUALA, Thunb.; Gen. PL, M.> 928.<br>[ccxxii.]                                                                                                                        |
| al collecting boxes, &c, for which its large, tough thallus<br>eculiarly suitable.<br>(ephelium Litchi, <i>Cantb.</i> , Vol. V.; also list of Fruits, Vol. III.,<br>LICUALA, Thunb.; Gen. PL, M.> 928.<br>[ccxxii.]                                                                                                                                                                                                                                                                                                                         |
| Licuala, Thunb.; Gen. PL, M.> 928.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| LICUALA, Thunb.; Gen. PL, M.> 928. [ccxxii.]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <i>—aPtti, ckatta-pat, kuruchipat, ASSAM; Kurud, kurkuti, BKNG.;</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| u, zaluben, BURM.; Kuruchipui, ASSAM; Kurua, Kurkui, BKNG.;<br>lu, zaluben, BURM.; Kdpadah, AND.<br>cences.—Roxb., FL Ind., Ed. C. B. C. <sub>9</sub> 299; Kurt, For. Fl. Burm., 11. <sub>%</sub>                                                                                                                                                                                                                                                                                                                                           |
| 71 Gamble, Man. Timb., 418; <b>Boyle, Fib. PL, 97; Balfour, Cyclop, 11.,</b><br>9; Indian Forester, I., 366.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| —A peltate-leaved palm of the forests of Assam, Eastern<br>ttagong, Burma, and the Andamans, said to extend westwards<br>kkim.                                                                                                                                                                                                                                                                                                                                                                                                              |
| c.—Griffith writes, "Major Jenkins informs me, 'the leaves DOMESTI<br>ta-pat are used for the same purposes as those of the toko" <b>344</b>                                                                                                                                                                                                                                                                                                                                                                                                |
| Jenkinsiana), "• but are much coarser and only made use of by ders. The demand for them is very great, scarcely a single                                                                                                                                                                                                                                                                                                                                                                                                                    |
| cow-keeper, or cooly but has <i>his jhapee</i> or <i>chattah'</i> "(umbrella-<br>ella) " ' made of <i>chattah*pat.</i> " The leaves are largely used                                                                                                                                                                                                                                                                                                                                                                                        |
| g, in the Andamans and the hill tracts of Chittagong, and when                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| rce, are largely exported to the plains for the same purpose<br>ter district. In certain parts of Burma they are employed in<br>ture of torches from <i>In</i> oil (see Dipterocarpus tuberculatus,                                                                                                                                                                                                                                                                                                                                         |
| <i>III.</i> , <i>161</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| LIGNITE. 345                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Is a fossil wood, somewhat carbonised, but still displaying<br>tructure. It is intermediate between peat and coal, and com<br>oor coal, boyey coal, brown coal, and basaltic coal. The fol                                                                                                                                                                                                                                                                                                                                                  |
| regarding its occurrence in India has been furnished by Mr. licott:—"Much of the substance called 'coal' and included OCCURRENCE                                                                                                                                                                                                                                                                                                                                                                                                            |
| head in the compilation on that subject, particularly that of<br>age, might be called lignite. True lignite occurs on the West 346                                                                                                                                                                                                                                                                                                                                                                                                          |
| Warakilli in the Travancore State, and again in parts of the strict. Very thick beds of a carbonaceous mud, which, however,                                                                                                                                                                                                                                                                                                                                                                                                                 |
| be called lignite, have also been found in the alluvium between<br>and Cuddalore."                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| on to the above-mentioned localities, the following are alluded                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| s writers. Atkinson states that in the North-West Provinces<br>of lignite appear near Ranibagh close to Haldwa'ni in the Bara.                                                                                                                                                                                                                                                                                                                                                                                                              |
| near Bhamauri, and in the streams of the Sub-Himálaya near<br>n the Bijnor District ( <i>Him. Dist., 291</i> ). Again, in the Pan-                                                                                                                                                                                                                                                                                                                                                                                                          |
| f Lignite are said to be found in the Shekh Budin range (Dera                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <i>Sett I. Rep., 34)</i> and in many parts of the Salt Range, more<br>in the hills between Kalabagn and the Chichali Pass in Isa                                                                                                                                                                                                                                                                                                                                                                                                            |
| t from the latter source was tried as fuel in the Indus Flotilla<br>several years before they ceased running up to Makhad, but                                                                                                                                                                                                                                                                                                                                                                                                              |
| be deficient in heat-giving power, to give off an immense quan-<br>e, and to be in every way inferior to coal ( <i>Bannu Settl. Rep.</i> ,                                                                                                                                                                                                                                                                                                                                                                                                  |
| has also been recorded from Chittagong, Burma, and Assam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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| 347                                           | Lignum-aloes, see Aquillaria Agallocha, Roxb. ; Vol. I., 279.<br>Lignum COlubrinum, see Strychnos colubrina, Linn.; Vol. VI.<br>LigustlCUm Ajawain, Fleming* seeCarum copticum, Benth.; VoliH-f<br>LIGUSTRUM, Linn.; Gen. PL, II., 679.<br>A genus of shrubs or trees, which belongs to the Natural Order OLEAC <sup>1</sup> ^,<br>and comprises 25 species, of which 11 are natives of India. I-* vulgare,<br>the privet, is a common hedge plant in Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| 347                                           | LigustlCUm Ajawain, Fleming* seeCarum copticum, Benth.; Vol. iH-f<br>LIGUSTRUM, Linn.; Gen. PL, II., 679.<br>A genus of shrubs or trees, which belongs to the Natural Order OLEAC <sup>1</sup> ^,<br>and comprises 25 species, of which 11 are natives of India. I-* vulgare,<br>the privet, is a common hedge plant in Europe.<br>[ Ic, t. 1243 ; OLEACEJE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 347                                           | <b>LIGUSTRUM,</b> <i>Linn.; Gen. PL, II., 679.</i><br>A genus of shrubs or trees, which belongs to the Natural Order OLEAC <sup>1</sup> ^, and comprises 25 species, of which 11 are natives of India. <b>I-* vulgare</b> , the privet, is a common hedge plant in Europe.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 347                                           | A genus of shrubs or trees, which belongs to the Natural Order OLEAC <sup>1</sup> ^,<br>and comprises 25 species, of which 11 are natives of India. <b>I-* vulgare</b> ,<br>the privet, is a common hedge plant in Europe. ^<br>[ <i>Ic, t. 1243 ;</i> OLEACEJE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 347                                           | and comprises 25 species, of which 11 are natives of India. I-* vulgare,<br>the privet, is a common hedge plant in Europe. [ <i>Ic, t. 1243 ;</i> OLEACEJE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 347                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                               | SynL. CANDOLLEANUM, Dene., not of Blume; OLEA ROXBURGHII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                               | Wall.<br>ReferencesDa/0. & Gibs., Bomb. FL, 159; Lisboa, U. PL Bomb.;9**<br>Habitat— A large shrub or small tree, commonly met with on the hills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| timber.<br>34S                                | of Southern India.<br>Structure of the Wood.—" Light-brown, rather close-grained, and<br>durable; generally used at Mahableshwar in the construction of huts and<br>for fuel" {Lisboa}.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 349                                           | <b>L. Roxburghii,</b> Clarke; FL Br. Ind., III., 613; Wight, Ic <sup>*</sup> t. 124,2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                               | <ul> <li>Syn.—LIGUSTRUM CANDOLLEANUM, Blume, not of Dene; L. ROBUSTUM,<br/>Bedd, not of Blume; L. COMPACTUM, Dene., not of H. f.&amp; T.; ULBA<br/>ROXBURGHII, Wall., not of Spreng. nor of Wight; VISIANIA ROBUSTA,<br/>Wight; PHILLYRBA TERMINALIS, Roxb.</li> <li>Considerable confusion exists in Indian economic literature regarding<br/>this plant. Most writers appear to have followed Branch's in giving the<br/>economic information of this species under L. robustum, H. f. &amp; T. (L.<br/>robustum, Blume); and the same, author has still more added to the con-<br/>fusion by giving two North-West Provinces vernacular names for that<br/>species, which in all probability ought to be applied to L. compactum, H.<br/>/. &amp; T. or L. nepalense, Wall. In any case, they can belong neither to<br/>L. robustum, Blume, a Bengal, nor to L. Roxburghii, Clarke, SL West<br/>Indian, plant.</li> </ul> |
| :                                             | References.—Brandts, For. FL, 3to; Beddome, For. Man., fS4i Gamble,<br>Man. Timb., 258; Lisboa, V. PL Bomb., 211; Ind. Forester, II., 2S »<br>VIII., 410.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 1                                             | Habitat.—A small tree, common on the mountains of Western India, at altitudes of 4,000 to 7,000 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| DOMESTIC.<br>Bark.                            | Domestic—In South India the BARK is put into the toddy of Caryota urens to cause rapid fermentation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 350                                           | <b>LILIUM,</b> Linn.; Gen. PL, III., Si6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 351                                           | Lilium giganteum, Wall.; Baker, Tulipece, in Jour. Linn. Soc.,<br>[ XIV., 22J ; LILIACEIB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| MEDICINE.<br>Leaves.<br>352<br>353 <u>f</u> t | Syn.—L. CORD 1 FOLIUM, Von.<br>Habitat.—A large lily of the Temperate Himalaya, from Kumaon and<br>Garhwal to Khasia and Sikkim, at altitudes of 5,000 to 10,000 feet.<br>. Medicine.—The LEAVES are employed as an external cooling applica-<br>tion to alleviate the pain of wounds and" bruises.<br>[XIV., 228.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                               | L. Wallichianum, SchultesfiL; Baker, Tulipece, in Jour. Linn. Soc<br><sup>s</sup> y? <sub>ivall</sub> LiLiUM BATISUA,Ham, L.JAPONICUM, D. Don; L. LONGIFLORUM,<br>Vern.—Findora, HIND.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                               | <sup>L</sup> - 353                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Limnanthemum, an Aquatic Plant. (J. Murray.) a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | LIMONIA<br>cidissima                          |
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| <ul> <li>References.—Atkinson, Him. Dist., 3'9, 740; Indian Forester, II., 26, 27.</li> <li>Habitat.—A herb of the Central Sub-temperate Himálaya, at altitudes of from 3,000 to 4,000 feet.</li> <li>Medicine.—The dried bulb SCALES possess demulcent properties and are used like salep in pectoral complamts (Atkinson).</li> <li>Limbolee oil, see Murraya Kcenigii, Spr. j Vol. V.</li> <li>Lime^ (Mineral), see Carbonate of Lime, Vol. II., 142—152.</li> <li>Lime (Fruit), see Citrus Medica, Linn.; var. 3, acida, and var. 4, Irimetta, Vol. II., 355, 357-</li> </ul>                                                                                                    | MEDICINE.<br>Scales.<br>354                   |
| LIMNANTHEMUM, 5. P. Gmel.; Gen. PL, II, 819.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                                             |
| Limnanthemum cristatum, Griseh.; FL Br. Ind., IV., 131;<br>[Wight, IlL, t. 157, bis.fig. 4; GENTIANACEJE.<br>Syn.—MENYANTHES CRISTATA, Roxb.; VILLARSIA CRISTATA, Spreng./<br>V. INOICA, Wall.<br>Vern.—Tagarmul, cumuda, cairava,ghain-cku, HIND.; Tagarmul, shiu-<br>lichhop, chuli, BENG.; Khatara, kumuda, BOMB.; Kolarechikal, MAR.;<br>Antara tamara, TEL.; Kdlanusarvoa, sitali, kumudwuti. SANS.<br>References.—Roxb., FL Ind., Ed. C.B.C., 154; Rheede, Hort. Mai., XI.,<br>t.29; Thwaites, En. Ceylon PL, 205; Dais. & Gibs., Bomb. Fl.,i\$8;<br>Sir W. Jones, Treatise Pi. Ind., V., 35; U. C. Dutt, Mat. Med. Hind.,                                                     | 355                                           |
| 302.318; Lisboa, V. PL Bomb., 16\$, 201; Gazetteers:—Bombay, XV.9<br>438*NWP.,IV., Ixxiv.; Ind. Forester, XIV., 39*-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                               |
| Habitat.—-A common aquatic herb throughout India.<br>Food and Fodder.—The STEMS, FRUIT, and LEAVES are eaten in cer-<br>tain localities at all times, curried or boiled; in others they are employed<br>only in times of scarcity.                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FOOD&<br>FODDER.<br>Stems.<br><b>350</b>      |
| L. nymphaeoides, Link; FL Br. Ind., IV.9 /?/.<br>Syn.—MENYANTHES NYMPH-SOIDES, Linn; VILLARSIA NYMPHJEOIDES,<br>Vent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | miit.<br>357                                  |
| <ul> <li>Vern.—Kuru, khair posh, guljafaripurnka, PB.</li> <li>References.—Stewart, Pb. PL, 148; Honigberger, Thirty-five years in the East, II., 364.</li> <li>Habitat.—A common aquatic herb in the lakes of Kashmfr, at altitudes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                      | Leaves.<br>358<br>359                         |
| of 6,000 to 9,000 feet.<br>Medicine.—Honigberger states that the fresh LEAVES are useful in<br>cases of "periodic headache."<br>Fodder.—Largely used as fodder in Kashmfr. Honigberger remarks<br>that it is supposed by the natives to increase the flow of milk in cows.                                                                                                                                                                                                                                                                                                                                                                                                           | MEDICINE.<br>Leaves.<br>360<br>FODDER.<br>361 |
| LIMONIA, Linn.; Gen. PL, /., 303.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 501                                           |
| <ul> <li>Limonia acidissima, Linn.; FL Br. Ind., /., 507/ RUTACE*.</li> <li>Syn.—L. CRENULATA, Roxb.; HESPERETHUSA ACIDISSIMA, CRENULATA<br/>AMBIGUA. Ram.</li> <li><sup>V</sup>??", T7^J<sup>*i</sup> r?!<sup>N D'*</sup> Bels*an, CHUTIA NAGPUR; Bhenta, URIYA; Bali,<br/>NW. P.; hein, kara, MERWARA; Rdn-limbu%, naringi, BOMB.; Kuweit<br/>nai-be'l, MAR.; Tor-elaga, TEL.; Naibela, nai-tel, KAN.: Tsjeru, caab-<br/>naregam, MALAY.; Thihay-aea, BURM.</li> <li>References^., FL Ind., Ed. CB.C, 364, Brandts, For. FL, 47,<br/>Kurz, For.FL Burm., I., 192; Beddome, FL Sylv, Anal. Gen'xh?<br/>Gamble, Man. Timb., \$9; Grah. Cat. Bomb. PL, 23; DaU. &amp; GihV</li> </ul> | 362                                           |
| Bomb.FL, 29; Elliot, FL Andhr. r83; Dymock, Mai. Med. W, Ind.,<br>2nd Ed., 32; Pharmacog. Ind., I., 267; Atkinson, Him. Dist., 307, 740;<br>Ec. Prod., NW. P., Pt. V., 49; Lisboa, U. Pl. Bomb., 33, 274; Indian<br>Forester, III., 200; XII., App., 9; Gusstteer, NW. P., lxix.<br>4«<br>L. 362                                                                                                                                                                                                                                                                                                                                                                                     |                                               |

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| LINDENB                                                     | The Darbers Daer-Ituit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <u>urticae</u>                                              | <u>íolia</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| MEDICINE.<br>Leave.<br>363<br>1901.<br>364<br>Fpuit.<br>365 | Habitat.—A spinous glabrous shrub or small tree, native of dry hills in<br>various parts of India. It has been recorded from the North-West Himá-<br>laya in Simla and Kumaon, ascending to 4,000 feet, from the Monghyr hills<br>in Behar, from Assam, and from the Bombay ghats and Coromandel south-<br>wards. It flowers in April-May, and fruits in the rainy season.<br>Medicine. Rheede noticed the medicinal virtues of this plant, writing,<br>"The LEAVES are supposed to be a remedy for epilepsy; the ROOT is<br>purgative, sudorific, and employed for the cure of colic and cardialgia^ The<br>dried FRUIT is tonic, diminishes intestinal fermentation, has the power of<br>resisting the contagion of small-pox, malignant and pestilent feyers, and<br>is also considered an excellent antidote to various poisons, on which'account<br>it is much sought for, and forms an article of commerce with Arab and<br>other merchants." Graham, Drury, and others quote the above, but give<br>no record of actual observation of the uses and value of the plant as a me-<br>dicine. Lisboa states that the berry is much used as a tonic in Malabar,<br>where it forms an article of commerce, and that its red coloured mucilage is<br>considered to be an antidote against snake-bite and the poisons of other<br>venomous animals. |
| FOOD.<br>Fruit.<br><b>366</b>                               | Food.—The FRUIT, a round berry, is very acid, but is occasionally em-<br>ployed as an article of food by Natives. The authors of the <i>Pharmacogra-<br/>phia Indica</i> state that it is exported to the Arabian coasts, where it is used<br>as a condiment with fish, meat, &C, being powdered along with the spices<br>commonly used in cooking.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| timber.<br>367                                              | Structure of the Wood.—Yellow, hard, and close-grained, weight 59ft per cubic foot; used for axles of oil-presses, rice-pounders, &c, and adapted for the lathe. ( <i>Lisboa</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DOMESTIC.<br>Fruit.<br><b>368</b>                           | Domestic—Drury remarks that the FRUIT is used in Java instead of<br>soap, a use which the autl ors of the <i>PUarmacographia Indica</i> state to be<br>also known in India, being indicated by the Marathi name, which signifies<br><sup>1</sup> Barber's Bael-fruit."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                             | LINARIA, Pers.; Gen. PL, IL <sub>9</sub> 932.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                             | Linaria glauca, <i>Spreng.</i> ; see Schweinfurthia sphaerocarpa, A. Braun.j<br>Vol. VI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 369                                                         | <ul> <li>L. ramosissima, Wall; FL Br. Ind., IV., 2ji; Wight, III. /., I6J.<br/>Syn.—LINARIA ROYLEI, Chavannes,<br/>Var. pubescens, Stocks ms.</li> <li>References. — Dais. &amp; Gibs., Bomb. Fl., 176; Stewart, Jour, of a Bot.<br/>Tour in Hasara, &amp;c, in Agri-Hort. Soc. of Ind., Jour. {Old Series},<br/>XIV., 6, 3j; Murray, PL and Drugs of Sind., 179; Gazetteers :—Botnb.9<br/>V., 27; NW. P., /., 83; IV Ixxv; X., 3H&gt;</li> <li>Habitat.—A spreading, branched herb, met with on rocks' and stony<br/>places throughout India, from the Panjab and Sind to Chittagong and<br/>Ceylon, ascending to an altitude of 5,000 feet; distributed westwards to<br/>Afghamistan and eastwards to Ava.</li> <li>The variety pubescens has been recorded by Stocks from Sind, and may<br/>publy be the L. giveners.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| medicine.<br>370                                            | probably be the L. cirrhosa described by Murray.<br>Medicine.—This species (including the variety, if the above supposition<br>be correct,) is valued in Sind as a remedy for diabetes <i>{Murray</i> }.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                             | LINDENBERGIA, Lehm.; Gen. PL, II., 948.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 371                                                         | [ScROPHULARINE-fi.]<br>Lindenbergia urticaeftilia, Lehm.; Fl. Br. Ind., IV., 262;<br>Syn.—STEMODIA RUDERALIS, Vahl.; S. MURALIS, Roxb.% BRACHYCORIS<br>PARVIFLORA, Schrad.<br>Vern—Dhol, MAR.<br>L. 371                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| A Substitute for Sassafras. (J. Murray)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LINOCIERA<br>intermedia. |
| <b>References.</b> —Roxb., Fl. Ind., Ed. C.B.C., 490; Dnlz. & Gibs., Bomb. Fl.<br>176; Dymock, Mat. Med. W.Ind., 581; Indian Forester, XII. (Abb)<br>18} Gazetteers—Bombay, V., 27; NW. P., 1,83s*., 3i <sub>4</sub> .<br>Habitat.—A diffuse, downy annual, common on walls and bank<br>throughout India, from Jamu to the Nilghiris and Tenasserim, ascendin<br>to 6,000 feet on the Himalaya; distributed westwards to Afghanistán.<br>Medicine.—Dymock writes, "The JUICE is given in chronic bronchitis<br>and, mixed with that of the Coriander, is applied to skin eruptions. The<br>plant*has a faint aromatic odour, and a slightly bitter taste." | L, K, S, S, MEDICINE.    |
| LINDERA, Thunb.; Gen. PL, III., 163.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |
| <ul> <li>Lindera Neesiana, Benth.; Fl. Br.Ind., V.9186; LAURINE^E.</li> <li>Syn.—APKRULA NEESIANA, Blume; BENZOIN NEESIANUM, Nees; TET<br/>RANTHEKA NEESIANA, Wall.; T. PRUNIFOLIA, Wall; LAURUS MACRO<br/>PHYLLA, Don.</li> <li>Reference.—Kurz. For., FL, II., 30g.</li> <li>Habitat —An aromatic tree met with in the Temperate Himalaya from<br/>Nepal to Sikkim, at altitudes of 6,000 to 8,000 feet, also in the drier hill<br/>forests of Burma, from Martaban down to Tenasserim—between 4,000 and<br/>5,000 feet.</li> </ul>                                                                                                                      |                          |
| Medicine.—Kurz remarks, "Yields excellent sassafras." It seems<br>possible that this plant may produce part of the "Sassafras of Nepal,"<br>supposed to be principally derived from Cinnamomum glanduliferum,<br><i>Meissn.</i> (See Vol. II., 317)                                                                                                                                                                                                                                                                                                                                                                                                        | 274                      |
| L. pulcherrima, Benth.; Fl. Br. Ind., V., J J.</td <td>375</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 375                      |
| <ul> <li>Syn.—DAPHNIDIUMPULCHERRIMUM, Nees.</li> <li>Vern.—Dadia, HIND.; Dingpingwai, KHASIA; Sisi, NEP.; Nupsor, LEP-CHA.</li> <li>References.— Brandts. For. FL, 383; Kurz., For. FL Burnt., II., 306; Gamble, Man. of Timb., 3i2; List of Trees, &amp;c, of Darjiling, 65.</li> <li>Habitat.—A large tree with hoary branchlets met with on the Temperate Himalaya from Kumaon, at altitudes of 5,000 to 8,000 feet, to Sikkim and Bhutan at altitudes of 4,000 to 9,000 feet; also on the Khasia mountains between 5,000 and 6,000 feet, and on hills in Martaban ascending to 6,000 feet.</li> </ul>                                                  |                          |
| Structure of the Wood.—" Reddish-white, moderately hard, even-grain-<br>ed, weight 33 to 40ft per cubic foot, used for building, cattle yokes, and<br>occasionally for tea-boxes" <i>{Gamble}</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                        | TIMBER.<br>376           |
| LINOCIERA, Swartz.; Gen. PL, II., 6^8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |
| Linociera intermedia, Wight; Fl. Br.Ind., III., 609; Wight,Ic. <sub>9</sub><br>[#• 735* <sup>12</sup> 4St OLEACE,E]<br>Syn.—CHURIANTHUS INTERMEDIA, Bedd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 377                      |
| <ul> <li>Var. Roxburghii, OLEA PANICULATA, Roxb.i O. ROXBURGHII, Spreng.</li> <li>O. ROXBURGHIANA, Koem. etSch.</li> <li>References.— Dalz. &amp; Gibs., Bomb. FL, 759; Bedd., Fl.Sylv., t. 230-For<br/>Man 153; Lisboa, U. PL Bomb., 97.</li> <li>Habitat.—A small or middle-sized glabrous tree met with on the Nilghiris, from i.ooo to 6,000 feet, also on the Anamallays, 5,000 feet. The variety Roxburghii is recorded from Orissa and the Circars, Chutia Nagpiir, the Western Ghats, and the Siwaliks.</li> </ul>                                                                                                                                 |                          |
| Structure of the Wood.—Beddome states that the typical species is valued as a timber by the Natives. Lisboa writes of the variety, "Wood pale-brown, hard, close-grained, durable, used for agricultural implements and turning."                                                                                                                                                                                                                                                                                                                                                                                                                          | TIMBER<br>378            |
| L. 378                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |

| BOLOK (<br>CENTRAL)<br>BOITEMICIEL SM                         | LIBRATRY                                                    | K<br>mm                    |  |  |
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